Second Biennial
REPORT

Department
OF
Wild Life and Fisheries

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STATE OF LOUISIANA
1946 - - - - - 1947

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Second Biennial Report

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DEPARTMENT
# of WILD LIFE and FISHERIES

STATE OF LOUISIANA

1946 - 1947

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Published by
DEPARTMENT OF WILD LIFE & FISHERIES
126 Civil Courts Building
New Orleans, La.
1948

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Edited and compiled by
Isaac D. Chapman, Director
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PERSONNEL

DEPARTMENT OF WILD LIFE AND FISHERIES

STATE OF LOUISIANA

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Commissioner

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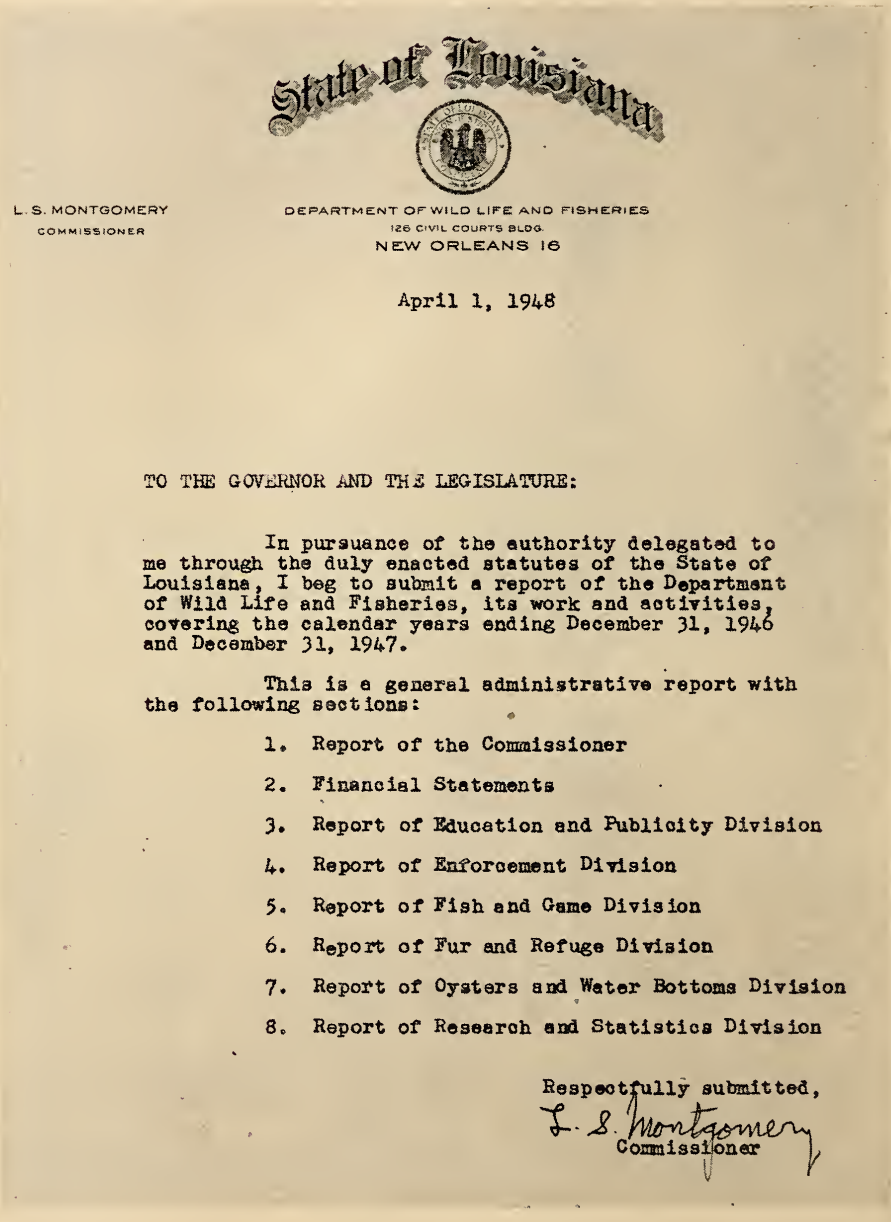
Chief Biologist

HARRY M. GRODE
Chief Accountant

LETTER OF TRANSMITTAL



State of Louisiana

L. S. MONTGOMERY
COMMISSIONER

DEPARTMENT OF WILD LIFE AND FISHERIES
126 CIVIL COURTS BLDG.
NEW ORLEANS 16

April 1, 1948

TO THE GOVERNOR AND THE LEGISLATURE:

In pursuance of the authority delegated to me through the duly enacted statutes of the State of Louisiana, I beg to submit a report of the Department of Wild Life and Fisheries, its work and activities, covering the calendar years ending December 31, 1946 and December 31, 1947.

This is a general administrative report with the following sections:

1. Report of the Commissioner
2. Financial Statements
3. Report of Education and Publicity Division
4. Report of Enforcement Division
5. Report of Fish and Game Division
6. Report of Fur and Refuge Division
7. Report of Oysters and Water Bottoms Division
8. Report of Research and Statistics Division

Respectfully submitted,
L. S. Montgomery
Commissioner

REPORT OF THE COMMISSIONER

New Orleans, La.

April 1, 1948

I have served as Commissioner of this Department since July 18, 1946. However this Report covers activities for the entire biennium period of 1946-47 and 1947-48.

The Department of Wild Life and Fisheries was created on December 11, 1944, when voters of Louisiana approved an Amendment to the State Constitution in the general election of November, 1944, to make three separate and independent state departments out of the former Department of Conservation. This Department was charged with the responsibility of protecting, conserving and propagating the wildlife of Louisiana, including wild game and non-game quadrupeds or animals, game, oysters, fish and other aquatic life.

The Department of Wild Life and Fisheries has seven divisions, each administered by a Director, responsible to the Commissioner, and each entrusted with responsibility of carrying on certain activities. The divisions are as follows:

1. Administration
2. Education and Publicity
3. Enforcement
4. Fish and Game
5. Fur and Refuge
6. Oysters and Water Bottoms
7. Research and Statistics

The revenues received and collected by the Department of Wild Life and Fisheries for the operating account during the two year period covered by this report have been greater by over $200,000 than the appropriation allocated to this Department. The operating account includes all divisions with the exception of the Fur and Refuge Division.

This Division has dedicated funds received from sales of furs and royalties and operates out of revenues from these dedicated funds.

Our actual revenues for the fiscal year ending June 30, 1947 amounted to $1,098,175.36, while the actual expenditures for that same period amounted to $885,275.15. Our estimated revenues for the fiscal year ending June 30, 1948 is estimated at $1,172,111.00, while our estimated expenditures for this period is figured at $950,300.00. Incidentally, revenues and collections for this Department during the current biennium have exceeded all previous records in Louisiana.

Considerable progress in all phases of wildlife conservation has been made in Louisiana during the period covered by this biennial report. Details of this progress will be found in the reports of the various divisions.

Several Pittman-Robertson scientific projects have been completed and others were inaugurated during the biennium. A water hyacinth elimination program for which the 1946 Legislature made a special appropriation has made good progress and for the first time in the history of the State a concerted effort has been under way to eliminate this pest. Details of the results will be found in the report of the Fish and Game Division.

We have made progress in our educational program through the organization of junior wildlife clubs in the state and other educational activity.

Louisiana still leads the nation in production of muskrats and a new fur bearer, the nutria or coypu has made considerable progress in the State. Our preserves have been improved and sales of furs from these state owned preserves have set new all time high records for revenues during the period covered by this report.

We have made headway in oyster and shrimp research and in other phases of our wildlife conservation program.

But above and beyond all other matters which this Department feels that it may congratulate itself upon from the period of time in which I have been Commissioner; I wish to call special attention to the fact that the very center and kernel of the work of this Department is that of enforcing the laws; that is to say in apprehending and prosecuting those who violate the fish, game, fur, shrimp, oysters and other laws which this Department is called upon to require observance. Obviously, without competent enforcement there would soon not be anything in the line of natural resources that would justify the continued existence of this Department.

In that connection we found that up until the year 1946 the prohibitions against violation of these laws were criminal in their nature and must be prosecuted therefore, before the criminal courts; by the district attorney. The office of the district attorney is one of very great importance; and in addition to being the criminal prosecutor of grave felonies, such as murder, manslaughter, arsony, embezzlement, etc., the district attorney is the civil adviser of a number of public boards. This will explain why in spite of the effective apprehension of violators and making charges against them before the criminal district courts, the district attorneys were unable to prosecute more than an average of about 33% of those charged. For instance, according to the reports of this Department made to the Legislature, in the period 1942-43, there was a total of 1,828 arrests made for violating the laws. At the time of that report dated April 1, 1946, 589 of these charges had passed into conviction; two were acquitted and 1,237 were still pending, a year and a half or two years after the arrests. For the period 1944-45, there were 2,604 arrests, 827 convictions and 48 acquittals, and still pending and not disposed of at the date of that report in April, 1946 were 1,733 cases. It might be noticed that offenders increased in number from 1,828 to 2,604; about 40% obviously because it was observed that there was a very good chance to escape prosecution.

It might be added in further respect to prosecuting violators criminally, that in several parishes a number of charges exceeded 100; in a dozen, a number of charges ran between 50 and 100. For example, the period 1944-45, 139 charges were filed in Madison Parish; 68 in Rapides; 91 in Natchitoches; 93 in Avoyelles; 130 in Calcasieu; 140 in St. Tammany; 145 in Jefferson; 109 in Plaquemines; 80 in St. Bernard. This will further explain why the Department attorneys were unable to get around with prosecution of offenders.

At the Legislative session of 1946 this Department presented to the Legislature, and obtained the passage of, laws, which created a civil liability in the violation of the laws which this Department is called on to enforce. This was not exactly an original matter with this Department; our legal adviser found that this had been done in other states; and there appeared to be no constitutional objection in this state to making the violation of these laws a civil offense; and the Legislature provided for civil demands to be made before justices of the peace, in addition to the criminal charges, which was still preserved; however, authorizing the dismissal of criminal charges where civil judgments were obtained and paid before the justice of the peace. The Legislation has been very effective. So far no lawyer has thought it advisable to appeal judgment to the Supreme Court or otherwise to test the law. Many district attorneys have expressed themselves as pleased to be relieved of this burden.

It is true that since this law went into effect September 1, 1946 this Department has made 2,435 arrests, practically the same number as was made one year previously. When it is noted that out of this number 1,700 were presented to the justices of the peace court as civil demands, of which 1,686 were disposed of, practically all consenting to judgment being entered and paying the same; we are enabled to hope that next year the noise of this justice of the peace demand having gotten around, there will be very much fewer law violations.

However, of the 2,435 arrests, 630 were presented under criminal charges, and not to the justices of the peace, with the result as before namely, 80 percent of them are still pending.

It might be added that the sum of $25,167.50 had been collected by way of these civil demands before the justice of the peace up to December 31, 1947; paid into school treasuries.

We think it is not unreasonable to hope that with this record, law enforcement will be far more effective hereafter.

Experience suggests that in a few particulars there is yet room for amendment and improvement in the laws; and I hope to make some recommendations.

Summing up, I believe it is a recognized fact that despite difficulties and obstacles, Louisiana has made definite progress in wildlife conservation during the past two years. The reports of the various divisions detailing this progress speaks for itself.

L. S. MONTGOMERY,
Commissioner.

Top photograph shows view of Presbytere Building across from famous Jackson Square in the New Orleans French Quarter, home of the Wildlife Museum operated by the Division of Education and Publicity. Bottom picture shows interior of spacious lecture room in museum where wildlife conservation motion pictures are also shown.

DEPARTMENT OF WILD LIFE AND FISHERIES

Financial Statements for the Fiscal Years
1946-1947 and 1947-1948

1. *Operating Account*
2. *Fur and Refuge Account*
3. *Oyster Seed Ground Account*
4. *Fur and Refuge—Marsh Island Improvement Fund*
5. *Dedicated Funds*
   (Act 22 of 1946)
6. *Civil Fees for Law Violations*
7. *Allen Dam Repair*
   (Act 83 of 1946)
8. *Horseshoe Break and Game Preserve*
   (Act 96 of 1946)
   Horseshoe Lake, Fish and Game Preserve
   (Act 97 of 1946)
9. *Bayou Grand Pierre Dam*
   (Act 144 of 1946)

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OPERATING ACCOUNT

	Actual 1946-1947	Estimated 1947-1948
MEANS OF FINANCING:		
State Appropriation other than Pittman - Robertson Federal Projects (Hyacinth Control and Coastal Waste Control included)	$851,276.00	$882,300.00
Resources other than State Appropriation	None	1,000.00

			Actual 1946-1947	Estimated 1947-1948
Pittman - Robertson Federal Projects:				
State Appropriation	$25,000.00	$25,000.00		
Less—To adjust to Federal Allotment on a 75% basis	6,906.72	8,250.00	18,093.28	16,750.00
Federal Allotment			54,279.86	50,250.00
TOTAL			$923,649.14	$950,300.00

	Actual 1946-1947	Estimated 1947-1948
Revenue Collections for the account of the Louisiana State Treasury:		
Severance Tax		
Gravel	$ .95	$ 1.00
Sand	1,581.93	1,500.00
Skins, Hides and Fur	126,134.60	100,000.00
Oyster Privilege	21,481.52	15,000.00
Shrimp	75,917.77	72,000.00
Licenses		
Angling	89,014.64	92,000.00
Hunting	334,970.17	335,000.00
Hunting Club	580.00	600.00
Fish Net	30,455.00	30,000.00
Fish Dealers and Agents	30,600.00	30,000.00
Vessel License	17,471.00	17,000.00
Oyster Dredging	8,600.00	6,000.00
Shrimp Seines	31,000.00	32,000.00
Freight or Ice Boats Carrying Shrimp	3,560.00	3,500.00
Non - Resident Commercial Fisherman's	25,600.00	6,000.00

	Actual 1946-1947	Estimated 1947-1948
Breeders for Private Bird and Animal Reserves	160.00	150.00
Trappers	24,516.00	24,000.00
Fur Buyers and Dealers	16,850.00	17,000.00
Bedding Ground Rents	23,278.00	22,000.00
Oyster Shop Resale	1,660.00	1,500.00
Releasing, Liens, Fees	35.00	25.00
Seismic Operations	1,877.85	1,000.00
Fines, Penalties	75.00	None
Dividends from Defunct Banks	None	660.00
Royalties from Mineral Leases —Dedicated to Conservation	231,104.62	365,000.00
Royalties from Fish Caught in Eagle Lake	596.01	None
Sale Confiscated Shrimp	50.00	None
Department Reports and other Publications	108.61	50.00
Prior Year Collections	842.47	100.00
Return of Commissions Unconsumed	54.22	25.00
TOTAL	$1,098,175.36	$1,172,111.00

Note: Revenue collections at an all-time high.

ANALYSIS OF EXPENDITURES BY UNITS:

DIVISION OF ADMINISTRATION

Class of Expenditures:

Salaries Continuing	$ 76,770.69	$ 76,600.00
Fees for professional services	136.25	None
Total Personal Services	$ 76,906.94	$ 76,600.00
Advertising	$ 283.63	$ 300.00
Cleaning and Waste Removal	157.60	220.00
Dues and Subscriptions	25.00	100.00

	Actual 1946-1947	Estimated 1947-1948
Heat, Light, Power, and Water	1,766.63	2,300.00
Insurance	294.21	550.00
Postage	2,513.41	2,700.00
Freight, Drayage, and Express	103.53	300.00
Printing, Binding, and Reproducing	11,428.62	7,500.00
Rents and use of Property	577.60	770.00
Equipment rental	None	130.00
Repairing and servicing property	1,606.72	1,600.00
Technical and mechanical services	148.15	340.00
Telephone and telegraph	3,904.37	5,400.00
Traveling expenses	6,363.15	7,600.00
Gas and Oil—State-owned cars	None	1,600.00
Total Contractual Services	$ 29,172.62	$ 31,410.00
Building supplies	$ .41	$ 40.00
Pains, varnishes, and painters supplies	None	20.00
Electrical supplies	17.03	50.00
Fuel (other than motor vehicle)	62.50	75.00
General plant operating supplies	8.87	100.00
Hand tools and minor equipment	9.31	100.00
Household supplies	4.73	100.00
Janitorial, laundry, and cleaning supplies	24.38	300.00
Lab., hospital, and med. supplies	16.39	25.00
Metal identification plates and badges	8.59	10.00
Motor Vehicle supplies	1,093.30	370.00
Office supplies	3,947.87	3,700.00

	Actual 1946-1947	Estimated 1947-1948
Repair supplies (equipment)	25.05	300.00
Sales tax, Use Tax	163.12	800.00
Total Supplies and Materials	$ 5,381.55	$ 5,990.00
Fees, taxes, and assessments	$ 28.95	None
Total Special Current Charges	$ 28.95	None
Total Ordinary Recurring Expenses	$111,490.06	$114,000.00
Less: Remuneration from Fur and Refuge Account for overhead assessments and administrative supervision	3,000.00	6,000.00
TOTAL NET	$108,490.06	$108,000.00
Automotive equipment	$ 8,205.36	None
Educational and recreational equipment	96.90	None
General plant equipment	117.18	None
Library books and equipment	None	100.00
Office furniture and equipment	2,849.09	200.00
Total Equipment — Capital Outlay	$ 11,268.53	$ 300.00
GRAND TOTAL OF EXPENDITURES	$119,758.59	$108,300.00

DIVISION OF EDUCATION AND PUBLICITY

Class of Expenditures:	Actual 1946-1947	Estimated 1947-1948
Salaries continuing	$ 20,501.88	$ 23,100.00
Salaries, seasonal or temporary	18.00	25.00
Fees for professional services	30.00	None
Total Personal Services	$ 20,549.88	$ 23,125.00
Cleaning and waste removal	$ 10.00	$ 20.00
Dues and subscriptions	377.35	325.00
Heat, light, power, and water	535.00	550.00
Insurance	315.13	400.00
Postage	2,811.01	2,000.00
Freight, drayage, and express	125.61	300.00
Printing, binding and reproducing	10,512.96	6,000.00
Rents and use of property	348.03	250.00
Repairing and servicing property	571.22	200.00
Technical and mechanical services	275.22	300.00
Telephone and telegraph	647.39	700.00
Traveling expenses	1,817.67	2,000.00
Gas and oil—State-owned cars	None	400.00
Total Contractual Services	$ 18,346.59	$ 13,445.00
Building supplies	None	$ 20.00
Paints, varnishes, and painters supplies	$ 5.55	10.00
Education and recreation supplies	647.80	420.00
Electrical supplies	54.36	100.00
General plant operating supplies	29.82	25.00
Hand tools and minor equipment	2.37	10.00
Janitorial, laundry, and cleaning supplies	62.14	50.00

	Actual 1946-1947	Estimated 1947-1948
Lab., hospital, and med. supplies	29.77	25.00
Motor vehicle supplies	787.45	100.00
Office supplies	23.76	200.00
Repair supplies (equipment)	8.00	20.00
Food supplies	.31	None
Total Supplies and Materials	$ 1,651.33	$ 980.00
Fees, taxes and assessments	$ .50	None
Total Special Current Charges	$ .50	None
Total Ordinary Recurring Expenses	$ 40,548.30	$ 37,550.00
Automotive equipment	$ 3,710.65	$ 1,564.00
Communications equipment	None	116.00
Educational and recreational equipment	339.83	60.00
General plant equipment	162.00	None
Office furniture and equipment	70.00	60.00
Total Equipment	$ 4,282.48	$ 1,800.00
Repairs to buildings	$ 122.00	None
Repairs to equipment	250.00	None
Total Major Repairs	$ 372.00	None
Total Capital Outlay	$ 4,654.48	$ 1,800.00
GRAND TOTAL OF EXPENDITURES	$ 45,202.78	$ 39,350.00

DIVISION OF RESEARCH AND STATISTICS

(Stream Control included) Class of Expenditures:	Actual 1946-1947	Estimated 1947-1948
Salaries continuing	$ 16,157.46	$ 19,760.00
Fees for professional services	None	5,740.00
Total Personal Services	$ 16,157.46	$ 25,500.00
Advertising	$ 1.88	$ 400.00
Dues and subscriptions	16.08	50.00
Insurance	136.62	165.00
Postage	97.10	480.00
Freight, drayage, and express	16.67	20.00
Printing, binding, and reproducing	5.60	50.00
Rents and use of property	7.00	20.00
Repairing and servicing property	441.63	400.00
Technical and mechanical services	2.95	None
Telephone and telegraph	321.81	600.00
Traveling expenses	4,922.81	7,000.00
Conference expenses	1.17	None
Total Contractual Services	$ 5,971.32	$ 9,185.00
Building supplies	$ 12.84	$ 60.00
Lumber	4.82	None
Paints, varnishes, and painters supplies	1.67	None
Education and recreation supplies	6.65	60.00
Electrical supplies	8.68	40.00
Engineering supplies	46.41	80.00
Fire fighting supplies	None	20.00
Fuel (other than motor vehicles)	None	40.00
General plant operating supplies	36.04	100.00
Hand tools and minor equipment	27.74	100.00
Janitorial, laundry, and cleaning supplies	1.78	18.00

	Actual 1946-1947	Estimated 1947-1948
Lab., hospital, and med. supplies	1,069.86	994.00
Motor vehicle supplies	151.91	292.00
Office supplies	350.09	615.00
Other supplies	1.23	None
Repair supplies (equipment)	19.15	60.00
Water, steam, ventilating, and drainage system materials	.37	None
Total Supplies and Materials	$ 1,739.24	$ 2,479.00
Fees, taxes, and assessments	$ 6.00	$ 6.00
Total Special Current Charges	$ 6.00	$ 6.00
Total Ordinary Recurring Expenses	$ 23,874.02	$ 37,170.00
Automotive equipment	$ 1,242.24	$ 1,700.00
Educational and recreational equipment	47.84	100.00
General plant equipment	968.83	None
Lab., hospital, and med. equipment	1,509.39	800.00
Library books and equipment	295.94	None
Office furniture and equipment	144.91	1,100.00
Refgr., air cond. equipment	1,880.56	None
Total Equipment	$ 6,089.71	$ 3,700.00
Repairs to buildings	$ 631.40	None
Total Major Repairs	$ 631.40	None
Total Capital Outlay	$ 6,721.11	$ 3,700.00
GRAND TOTAL OF EXPENDITURES	$ 30,595.13	$ 40,870.00

DIVISION OF ENFORCEMENT

Class of Expenditures:	Actual 1946-1947	Estimated 1947-1948
Salaries continuing	$219,209.13	$241,500.00
Salaries, seasonal or temporary, wages of laborers	45.00	None
Fees for professional services	275.60	1,000.00
Total Personal Services	$219,529.73	$242,500.00
Advertising	None	$ 10.00
Cleaning and waste removal	$ 65.70	100.00
Dues and subscriptions	None	35.00
Heat, light, power, and water	342.56	500.00
Insurance	6,886.44	7,800.00
Postage	100.27	350.00
Freight, drayage, and express	128.97	200.00
Printing, binding, and reproducing	266.84	600.00
Rents and use of property	1,808.56	2,000.00
Repairing and servicing property	2,222.03	2,000.00
Technical and mechanical services	182.92	200.00
Telephone and telegraph	835.71	1,600.00
Traveling expenses	88,414.47	95,500.00
Gas and oil—State-owned cars	None	3,500.00
Total Contractual Services	$101,254.47	$114,395.00
Building supplies	$ 41.72	$ 100.00
Lumber	31.20	300.00
Paints, varnishes, and painters supplies	555.28	600.00
Clothing supplies	19.60	25.00
Education and recreation supplies	12.75	25.00
Electrical supplies	21.10	200.00
Feed and forage supplies	4.10	40.00
Fire Fighting supplies	22.08	40.00

	Actual 1946-1947	Estimated 1947-1948
Fuel (other than motor vehicle)	88.08	200.00
General Plant operating supplies	648.71	850.00
Hand tools and minor equipment	56.27	200.00
Household supplies	139.71	300.00
Janitorial, laundry, and cleaning supplies	43.81	200.00
Lab., hospital, and Med. supplies	119.56	200.00
Motor Vehicle supplies	5,255.78	6,000.00
Office supplies	7.75	100.00
Other supplies	21.57	50.00
Police supplies	13.50	100.00
Repair supplies (equipment)	1,698.87	2,000.00
Evidence material	3.84	50.00
Food supplies	3,789.49	6,000.00
Total Supplies and Materials	$ 12,594.77	$ 17,580.00
Fees, taxes, and assessments	$ 8.25	$ 25.00
Total Special Current Charges	$ 8.25	$ 25.00
Total Ordinary Recurring Expenses	$333,387.22	$374,500.00
Automotive equipment	$ 15,768.42	$ 16,800.00
Building and power plant equipment	20.42	400.00
Communications equipment	6.70	500.00
Construction equipment	3.00	None
Educational and recreational equipment	64.57	None
General plant equipment	6,412.72	4,100.00
Horticultural and farm equipment	None	100.00

	Actual 1946-1947	Estimated 1947-1948
Household furniture and equipment	68.30	None
Office furniture and equipment	166.66	200.00
Refgr., air cond. equipment	1,117,50	None
Total Equipment	$ 23,628.29	$ 22,100.00
Repairs to equipment	None	$ 900.00
Total Major Repairs	None	$ 900.00
Total Capital Outlay	$ 23,628.29	$ 23,000.00
GRAND TOTAL OF EXPENDITURES	$357,015.51	$397,500.00

DIVISION OF OYSTER AND WATER BOTTOMS

(Coastal Waste Control included)

Class of Expenditures:

Salaries continuing	$ 32,257.47	$ 50,400.00
Annual leave, employees transferred to other State Departments	181.33	None
Total Personal Services	$ 32,438.80	$ 50,400.00
Advertising	$ 132.60	$ 250.00
Cleaning and waste removal	88.04	140.00
Dues and subscriptions	52.00	30.00
Heat, light, power, and water	6.32	40.00
Insurance	2,409.18	4,140.00
Postage	209.13	250.00
Freight, drayage, and express	49.76	150.00
Printing, binding, and reproducing	1,705.92	600.00
Rents and use of property	158.25	620.00
Repairing and servicing property	3,678.52	4,500.00

	Actual 1946-1947	Estimated 1947-1948
Technical and mechanical services	462.68	1,000.00
Telephone and telegraph	1,037.07	2,500.00
Traveling expenses	4,577.66	10,400.00
Gas and oil—State-owned cars	None	2,500.00
Total Contractual Services	$ 14,567.13	$ 27,120.00
Building supplies	$ 1,318.76	$ 200.00
Lumber	97.81	1,000.00
Paints, varnishes, and painters supplies	218.77	500.00
Clothing supplies	60.15	None
Container deposits	80.00	None
Education and recreational supplies	15.97	100.00
Electrical supplies	73.41	100.00
Engineering supplies	None	10.00
Fire fighting supplies	294.38	80.00
Fuel (other than motor vehicle)	11.36	500.00
General plant operating supplies	211.58	500.00
Hand tools and minor equipment	56.70	300.00
Household supplies	583.83	350.00
Janitorial, laundry, and cleaning supplies	38.83	150.00
Lab., hospital, and med. supplies	999.04	320.00
Metal identification plates and badges	103.95	None
Motor vehicle supplies	5,074.89	7,700.00
Office supplies	74.24	200.00
Other supplies	4.98	None
Repair supplies (equipment)	946.25	3,000.00
Road maintenance materials	None	10.00
Food supplies	1,647.04	6,100.00
Total Supplies and Materials	$ 11,911.94	$ 21,120.00

	Actual 1946-1947	Estimated 1947-1948
Fees, taxes, and assessments	$ .50	$ 10.00
Seismic Agent leave	None	2,150.00
Total Special Current Charges	$ .50	$ 2,160.00
Total Ordinary Recurring Expenses	$ 58,918.37	$100,800.00
Automotive equipment	$ 30,975.31	None
Building and power plant equipment	114.95	None
Communications equipment	None	$ 360.00
Educational and recreational equipment	425.88	None
Fire fighting equipment not otherwise classified	23.60	None
General plant equipment	4,679.51	1,400.00
Household furniture and equipment	1,052.95	None
Lab., hospital, and med. equipment	4,334.25	1,000.00
Office furniture and equipment	678.96	300.00
Refgr., air cond. equipment	453.22	120.00
Total Equipment — Capital Outlay	$ 42,738.63	$ 3,180.00
GRAND TOTAL OF EXPENDITURES	$101,657.00	$103,980.00

DIVISION OF FISH AND GAME

(Hyacinth Control included)

Class of Expenditures:

Salaries continuing	$ 52,912.18	$ 75,630.00
Wages of laborers	2,057.10	1,000.00
Fees for professional services	2,183.57	1,500.00
Total Personal Services	$ 57,152.85	$ 78,130.00

	Actual 1946-1947	Estimated 1947-1948
Advertising	$ 108.46	None
Cleaning and waste removal	13.90	None
Deposit on services	14.88	None
Dues and subscriptions	72.00	None
Heat, light, power, and water	1,022.37	$ 1,200.00
Insurance	2,621.18	2,800.00
Music and entertainment	16.64	None
Postage	151.94	300.00
Freight, drayage, and express	119.68	None
Printing, binding, and reproducing	6,843.01	200.00
Rents and use of property	298.40	140.00
Repairing and servicing property	3,271.45	3,600.00
Technical and mechanical services	4,730.17	6,475.00
Telephone and telegraph	1,152.40	1,000.00
Traveling expenses	11,033.80	23,500.00
Total Contractual Services	$ 31,470.28	$ 39,215.00
Building supplies	$ 306.31	$ 200.00
Lumber	235.71	None
Paints, varnishes, and painters supplies	203.07	None
Clothing supplies	237.68	None
Education and recreation supplies	879.79	500.00
Electrical supplies	80.92	100.00
Feed and forage supplies	3,935.83	4,400.00
Fire fighting supplies	None	100.00
Fuel (other than motor vehicle)	124.94	100.00
General plant operating supplies	643.38	600.00
Hand tools and minor equipment	101.25	30.00
Horticultural and farm supplies	57,046.42	42,625.00
Household supplies	2.07	None
Janitorial, laundry, and cleaning supplies	5.59	100.00

	Actual 1946-1947	Estimated 1947-1948
Lab., hospital, and med. supplies	662.74	1,100.00
Motor vehicle supplies	5,863.98	6,170.00
Office supplies	134.34	500.00
Police supplies	8.83	None
Repair supplies (equipment)	295.99	300.00
Road maintenance materials	76.95	200.00
Water, steam, ventilating, and drainage system materials	None	400.00
Food supplies	1.21	None
Total Supplies and Materials	$ 70,847.00	$ 57,425.00
Total Ordinary Recurring Expenses	$159,470.13	$174,770.00
Automotive equipment	$ 13,755.91	$ 9,230.00
Building and power plant equipment	357.45	None
General plant equipment	6,192.26	2,500.00
Horticultural and farm equipment	888.75	None
Lab., hospital, and med. equipment	198.15	500.00
Library books and equipment	213.24	300.00
Livestock	378.00	5,000.00
Office furniture and equipment	419.60	None
Total Equipment	$ 22,403.36	$ 17,530.00
Repairs to Dams, spillways	None	$ 1,000.00
Repairs to equipment	$ 532.97	None
Total Major Repairs	$ 532.97	$ 1,000.00
Land and construction projects (buildings)	$ 6,645.19	None

	Actual 1946-1947	Estimated 1947-1948
Total Land and Construction Projects	$ 6,645.19	None
Total Capital Outlay	$ 29,581.52	$ 18,530.00
GRAND TOTAL OF EXPENDITURES	$189,051.65	$193,300.00

DIVISION OF PITTMAN-ROBERTSON

Class of Expenditures:

	Actual 1946-1947	Estimated 1947-1948
Salaries continuing	$ 27,972.50	$ 32,280.00
Wages of laborers	None	400.00
Annual leave—employee transfer	—15.25	None
Total Personal Services	$ 27,957.25	$ 32,680.00
Cleaning and waste removal	$ 1.36	None
Insurance	261.05	$ 400.00
Freight, drayage, and express	4.82	None
Printing, binding, and reproducing	55.46	400.00
Rents and use of property	827.10	1,200.00
Repairing and servicing property	353.36	400.00
Technical and mechanical services	46.00	None
Telephone and telegraph	249.94	600.00
Traveling expenses	8,339.08	11,000.00
Total Contractural Services	$ 10,138.17	$ 14,000.00
Building supplies	$ 3.43	None
Lumber	110.12	None
Paints, varnishes, and painters supplies	61.71	None
Education and recreation supplies	48.14	None
Electrical supplies	30.71	None

	Actual 1946-1947	Estimated 1947-1948
Feed and forage supplies	240.00	None
Fuel (other than motor vehicle)	2.84	None
General plant operating supplies	111.09	$ 1,200.00
Hand tools and minor equipment	39.23	200.00
Horticultural and farm supplies	889.79	3,200.00
Janitorial, laundry, and cleaning supplies	6.24	None
Motor vehicle supplies	799.24	2,000.00
Office supplies	39.09	500.00
Other supplies	None	600.00
Repair supplies (equipment)	110.30	400.00
Water, steam, ventilating, and drainage system materials	18.40	None
Total Supplies and Materials	$ 2,510.33	$ 8,100.00
Total Ordinary Recurring Expenses	$ 40,605.75	$ 54,780.00
Automotive equipment	$ 806.09	$ 10,020.00
Educational and recreational equipment	None	600.00
General plant equipment	361.48	800.00
Lab., hospital, and med. equipment	None	400.00
Office furniture, equipment	221.17	400.00
Total Equipment — Capital Outlay	$ 1,388.74	$ 12,220.00
GRAND TOTAL OF EXPENDITURES	$ 41,994.49	$ 67,000.00
GRAND TOTAL OF EXPENDITURES — OPERATING ACCOUNT	$885,275.15	$950,300.00

We wish to direct attention to the fact that the revenues are over $200,000.00 in excess of expenditures, reflecting our continued self-sustaining financial condition.

FUR AND REFUGE ACCOUNT

	Actual 1946-1947	Estimated 1947-1948
MEANS OF FINANCING:		
Dedicated revenues to the propagation and protection of preserves:		
Sale of furs	$ 65,481.78	$125,000.00
Sale of alligator skins	1,800.55	1,500.00
Rentals of unimproved lands —pasture	2,242.00	2,000.00
Game warden services	2,096.56	2,000.00
Pass-a-Loutre Hunting Club fees	3,727.00	None
TOTAL	$ 75,347.89	$130,500.00

Cash balance fiscal year ending June 30, 1946	$100,828.50
Revenue fiscal year ending June 30, 1947	75,347.89
	$176,176.39
Expenditures fiscal year ending June 30, 1947	116,115.51
Unencumbered balance June 30, 1947	$ 60,060.88
Estimated revenue fiscal year ending June 30, 1948	130,500.00
	$190,560.88
Estimated expenditures fiscal year ending June 30, 1948	105,240.00
Unencumbered balance June 30, 1948 —estimated	$ 85,320.88

	Actual 1946-1947	Estimated 1947-1948
ANALYSIS OF EXPENDITURES:		
Class of Expenditures:		
Salaries continuing	$ 62,796.40	$ 58,000.00
Salaries, seasonal or temporary	None	4,000.00

	Actual 1946-1947	Estimated 1947-1948
Wages of laborers	78.50	None
Total Personal Services	$62,874.90	$ 62,000.00
Advertising	$ 186.20	$ 200.00
Cleaning and waste removal	190.27	200.00
Deposits on services	20.00	40.00
Heat, light, power, and water	30.58	50.00
Insurance	7,590.42	5,300.00
Postage	166.54	200.00
Freight, drayage, and express	245.18	300.00
Printing, binding, and reproducing	212.30	250.00
Rents and use of property	525.00	600.00
Repairing and servicing property	2,023.75	2,000.00
Technical and mechanical services	280.00	None
Telephone and telegraph	558.92	750.00
Traveling expenses	9,353.27	11,000.00
Gas and oil—State-owned cars	None	2,000.00
Total Contractual Services	$ 21,382.43	$ 22,890.00
Building supplies	$ 515.11	$ 500.00
Lumber	1,256.96	500.00
Paints, varnishes, and painters supplies	478.19	200.00
Clothing supplies	51.27	None
Comforts and toilet articles	.38	None
Container deposits	86.30	100.00
Education and recreation supplies	14.27	None
Electrical supplies	85.15	100.00
Fire fighting supplies	69.29	100.00
Fuel (other than motor vehicle)	41.46	150.00
General plant operating supplies	814.06	800.00
Hand tools and minor equipment	247.93	300.00
Horticultural and farm supplies	23.17	None

	Actual 1946-1947	Estimated 1947-1948
Household supplies	1,330.99	500.00
Janitorial, laundry, and cleaning supplies	86.20	150.00
Lab., hospital, and med. supplies	30.22	50.00
Metal identification plates and badges	45.08	100.00
Motor vehicle supplies	3,727.82	4,000.00
Office supplies	431.06	400.00
Repair supplies (equipment)	1,762.38	1,000.00
Road maintenance	17.50	None
Water, steam, ventilating, and drainage system materials	615.60	None
Food supplies	3,386.89	3,500.00
Total Supplies and Materials	$ 15,117.28	$ 12,450.00
Fees, taxes, and assessments	$ 3,005.50	$ 6,000.00
Total Special Current Charges	$ 3,005.50	$ 6,000.00
Total Ordinary Recurring Expenses	$102,380.11	$103,340.00
Automotive equipment	$ 3,197.95	$ 1,200.00
Building and power plant equipment	105.30	100.00
Construction equipment	87.37	None
Educational and recreational equipment	108.28	None
General plant equipment	1,957.95	500.00
Household furniture and equipment	582.20	100.00
Office furniture and equipment	166.95	None
Refgr. and air cond. equipment	408.50	None
Total Equipment	$ 6,614.50	$ 1,900.00

	Actual 1946-1947	Estimated 1947-1948
Repairs to equipment	$ 1,073.28	None
Total Major Repairs	$ 1,073.28	None
Buildings	$ 5,084.62	None
Dams, Spillways, Docks	963.00	None
Total Land and Construction Projects	$ 6,047.62	None
Total Capital Outlay	$ 13,735.40	$ 1,900.00
GRAND TOTAL OF EXPENDITURES	$116,115.51	$105,240.00

OYSTER SEED GROUND ACCOUNT

MEANS OF FINANCING:

Dedicated revenue to the establishment of Oyster Seed Grounds and to the planting, propagation, cultivating, policing, preservation, and distribution of oysters as set forth in Act No. 227:		
Tax on shells taken from State-owned waterbottoms	$ 89,576.91	$100,000.00

Cash balance fiscal year ending June 30, 1946	$ 40,166.22
Revenue fiscal year ending June 30, 1947	89,576.91
	$129,743.13
Expenditures fiscal year ending June 30, 1947	75,429.52
Unencumbered balance June 30, 1947	$ 54,313.61

	Actual 1946-1947	Estimated 1947-1948
Estimated revenue fiscal year ending June 30, 1948	100,000.00	
	$154,313.61	
Estimated expenditures fiscal year ending June 30, 1948	131,500.00	
Unencumbered balance June 30, 1948—estimated	$ 22,813.61	

ANALYSIS OF EXPENDITURES:

Class of Expenditures:		
Salaries continuing	$ 10,552.93	$ 15,200.00
Total Personal Services	$ 10,552.93	$ 15,200.00
Advertising	None	$ 100.00
Heat, light, power, and water	$ 20.20	None
Cleaning and waste removal	None	20.00
Insurance	2,248.01	2,770.00
Freight, drayage, and express	249.17	30.00
Printing, binding, and reproducing	57.75	100.00
Rents, use of property	385.20	100.00
Repairing and servicing property	1,623.82	1,000.00
Technical and mechanical services (Oyster shell planting)	4,271.83	76,000.00
Telephone and telegraph	221.46	520.00
Traveling expenses	5,028.95	5,600.00
Total Contractual Services	$ 14,106.39	$ 86,240.00
Building supplies	$ 78.37	$ 30.00
Lumber	3,539.44	70.00
Paints, varnishes and painters supplies	80.65	200.00
Container deposits	8.00	None

	Actual 1946-1947	Estimated 1947-1948
Education and recreation supplies	6.08	None
Electrical supplies	27.83	290.00
Fire fighting supplies	205.08	None
Food supplies	495.04	200.00
Fuel (other than motor vehicle)	56.87	100.00
General plant operating supplies	510.69	200.00
Hand tools and minor equipment	20.40	None
Household supplies	673.62	600.00
Janitorial, laundry, and cleaning supplies	18.43	10.00
Motor vehicle supplies	1,976.25	3,800.00
Office supplies	1.50	50.00
Other supplies	15.40	10.00
Repair supplies (equipment)	1,360.99	1,000.00
Water, steam, ventilating, and drainage system materials	None	200.00
Total Supplies and Materials	$ 9,074.64	$ 6,760.00
Fees, taxes, and assessments	5.50	None
Total Special Current Charges	$ 5.50	None
Total Ordinary Recurring Expenses	$ 33,739.46	$108,200.00
Automotive equipment	$ 23,910.64	None
Building and power plant equipment	1,630.84	$ 1,700.00
Educational and recreational equipment	36.86	50.00
General plant equipment	118.87	800.00
Household furniture and equipment	611.57	2,250.00
Library books and equipment	10.00	None

	Actual 1946-1947	Estimated 1947-1948
Refgr. and air cond. equipment	389.36	500.00
Total Equipment	$ 26,708.14	$ 5,300.00
Land and construction projects (buildings)	$ 14,981.92	$ 18,000.00
Total Land and Construction Projects	$ 14,981.92	$ 18,000.00
Total Capital Outlay	$ 41,690.06	$ 23,300.00
GRAND TOTAL OF EXPENDITURES	$ 75,429.52	$131,500.00

FUR AND REFUGE—MARSH ISLAND IMPROVEMENT FUND

MEANS OF FINANCING:

Funds received from the Russell Sage-Marsh Island Lease for improvements to the Marsh Island Refuge:

Cash balance fiscal year ending June 30, 1946	$108,340.46
Expenditures fiscal year ending June 30, 1947	7,748.81
Unencumbered balance June 30, 1947	$100,591.65
Estimated expenditures fiscal year ending June 30, 1948	44,365.00
Unencumbered balance June 30, 1948—estimated	$ 56,226.65

ANALYSIS OF EXPENDITURES:

Class of Expenditures:	Actual 1946-1947	Estimated 1947-1948
Salaries continuing	$ 1,691.00	$ 1,400.00
Fees for professional services	None	300.00
Total Personal Services	$ 1,691.00	$ 1,700.00
Insurance	$ 65.00	$ 200.00
Freight, drayage, and express	28.57	25.00
Printing, binding, and reproducing	None	15.00
Repairing and servicing property	1,711.94	1,800.00
Technical and mechanical services (wells)	2.53	5,500.00
Telephone and telegraph	None	150.00
Traveling expenses	.82	100.00
Total Contractual Services	$ 1,808.86	$ 7,790.00
Building supplies	$ 196.44	$ 600.00
Lumber	116.63	100.00
Paints, varnishes and painters supplies	None	90.00
Container deposits	12.00	None
Education and recreation supplies	2.73	None
Electrical supplies	47.05	20.00
Fuel supplies (other than motor vehicle)	None	50.00
General plant operating supplies	72.58	800.00
Hand tools and minor equipment	70.20	20.00
Household supplies	17.01	230.00
Janitorial, laundry, and cleaning supplies	6.23	5.00
Motor vehicle supplies	213.56	800.00
Repair supplies (equipment)	21.90	1,500.00

	Actual 1946-1947	Estimated 1947-1948
Water, steam, ventilating, and drainage system materials	None	60.00
Food supplies	407.43	100.00
Total Supplies and Materials	$ 1,183.76	$ 4,375.00
Total Ordinary Recurring Expenses	$ 4,683.62	$ 13,865.00
Automotive equipment	$ 1,677.13	$ 10,000.00
Building and power plant equipment	None	300.00
Construction equipment	28.13	None
General plant equipment	674.30	2,200.00
Total Equipment	$ 2,379.56	$ 12,500.00
Repairs to equipment	$ 423.19	None
Total Major Repairs	$ 423.19	None
Grading, earthwork, and small drainage structures	None	$ 5,000.00
Buildings	$ 262.44	13,000.00
Total Land and Construction Projects	$ 262.44	$ 18,000.00
Total Capital Outlay	$ 3,065.19	$ 30,500.00
GRAND TOTAL OF EXPENDITURES	$ 7,748.81	$ 44,365.00

DEDICATED FUNDS—ACT 22 OF 1946

PROCEEDS ONE-HALF RESIDENT HUNTING LICENSE ALLOTTED AS FOLLOWS:

50% for purchase, construction, and maintenance of Public Shooting Grounds	$ 79,023.86
25% for Predatory Control	39,511.93
25% for Replenishment of Migratory Waterfowl	39,511.93
Total proceeds June 30, 1947	$158,047.72

EXPENDITURES:

To Ducks Unlimited for replenishment of migratory waterfowl at June 30, 1947	34,981.14

CIVIL FEES FOR LAW VIOLATIONS

FEES COLLECTED AND TRANSMITTED TO THE FOLLOWING PARISH SCHOOL BOARDS DURING FISCAL YEAR 1946-1947:

Allen	$ 62.50
Ascension	286.67
Assumption	150.00
Avoyelles	112.50
Beauregard	181.50
Bienville	150.00
Bossier	100.00
Caddo	25.00
Calcasieu	125.00
Caldwell	12.50
Cameron	350.00
Catahoula	400.06
Claiborne	87.50
Concordia	692.24
DeSoto	75.00
East Bat. Rouge	299.82
East Carroll	50.00
East Feliciana	25.00
Evangeline	37.50
Franklin	50.00
Grant	387.50
Iberia	112.50
Iberville	435.75
Jackson	125.00
Jefferson	662.50
Lafayette	25.00
Lafourche	12.50
LaSalle	287.50
Livingston	$ 47.50
Morehouse	212.50
Natchitoches	187.50
Ouachita	610.58
Plaquemines	325.00
Pointe Coupee	350.00
Rapides	12.50
Red River	212.50
Richland	75.00
Sabine	80.00
St. Bernard	37.50
St. Charles	325.00
St. James	193.50
St. John Baptist	137.50
St. Landry	462.50
St. Martin	137.50
St. Mary	149.64
St. Tammany	500.00
Tangipahoa	100.00
Terrebonne	737.50
Vermilion	375.00
Vernon	375.00
Washington	487.50
West Bat. Rouge	200.00
West Carroll	25.00
West Feliciana	137.50
Winn	175.00
Total	$11,989.76

ALLEN DAM REPAIR SPECIAL APPROPRIATION

ACT 83 of 1946—$30,000.00

	Actual 1946-1947	Estimated 1947-1948
Expenditures	$ 24,353.36	$ 5,646.64

HORSESHOE BREAK AND GAME PRESERVE

HORSESHOE LAKE, FISH AND GAME PRESERVE

ACTS 96 and 97 of 1946

CONSTRUCTION OF DAM AND SPILLWAY

Funds derived from Marsh Island Lease Fund	$ 25,000.00

	Actual 1946-1947	Estimated 1947-1948
Expenditures	None	$ 25,000.00

BAYOU GRAND PIERRE DAM SPECIAL APPROPRIATION

ACT 144 OF 1946—$100,000.00

Expenditures	$ 425.00	$ 99,575.00

DIVISION OF EDUCATION AND PUBLICITY

ISAAC D. CHAPMAN, *Director*

It is the responsibility of this Division to "inform" the public of the work of the Department and it is a part of its job to "educate" the people on the importance of Louisiana's game and fish resources, and this is being accomplished through public relations, newspapers, magazines, radio, meetings, schools and other recognized mediums. It is the responsibility of this Division to create and maintain interest in programs and projects pertaining to wildlife conservation.

Thus a favorable public opinion is created, and this is reflected in many ways. The fact that there has been an increasing number of convictions for various fish and game violations in the courts of our State, is due not only to an alert, active and improvement enforcement staff, but also partly due to mounting public sentiment favoring strict enforcement of the State's fish and game laws and protection of the State's wildlife and fisheries resources.

Advertising, education and public relations to be effective, must be continuous. This is especially true in the field of wildlife conservation. It is evident to every citizen that there has been created in Louisiana in recent years a new and more favorable public sentiment and interest in the State's wildlife and fisheries resources. And this new renaissance can be attributed largely to effective education and public relations.

WILD LIFE MUSEUM

The Louisiana Department of Wild Life and Fisheries is one of the few State Departments in the nation maintaining and operating a museum of natural resources. This museum is located in the Presbytere Building in New Orleans across from famous Jackson square. The museum is located in a state-owned building operated by the Louisiana State Museum and its operating costs are held down to a minimum.

There are more than 2,500 individual exhibits of wild life and fish in the museum and these are constantly being

DEPARTMENT OF WILDLIFE and FISHERIES
DIVISION OF EDUCATION AND PUBLICITY

One of two special exhibits used at Parish Fairs in Louisiana during the 1947 Fair season.

added to by a technical staff which consists of one taxidermist and one artist. Other personnel required to operate the museum are one custodial worker and one receptionist.

In the museum a lecture room is available with a seating capacity of over 200. In this room lectures are given and motion pictures are shown on various wildlife conservation subjects to schools and other groups who visit the museum. An average of 5,000 people each month visit this museum. One person in charge of our motion picture library also serves as a lecturer to groups who visit the museum and her services are also available to women garden clubs, schools and other groups anywhere in Louisiana.

EXHIBITS

Educational exhibits are an important part of our educational and information activity, especially during the Fall fair season. During the years 1946 and 1947, this Division had two exhibits showing simultaneously at parish fairs and expositions throughout the State. Due to the fact that many parish fairs are held at the same time, it is not possible to participate in all of them, but with two exhibits we were able to take in nearly a dozen fairs during each of the two years of the past biennium.

We also have a portable exhibit ideal for hotel lobbies and this exhibit has been rotated from hotel to hotel and has been seen by thousands of people in hotel lobbies of many of our principal cities.

In the latter part of 1945 this Division entered into a joint agreement with the Department of Agriculture, for the construction of a huge migratory waterfowl exhibit at the permanent Louisiana State Exhibit Building located on the State Fair grounds in Shreveport. One taxidermist from this Division was assigned to assist in constructing the exhibit which was finally completed the latter part of 1947 and is considered one of the most complete and finest migratory waterfowl exhibits of its kind in the nation. In order to render more such services to the people of North Louisiana,

One view of the migratory waterfowl exhibit in the Louisiana State Exhibits Building on the State Fair Grounds in Shreveport.

this taxidermist is on present permanent assignment in the Shreveport area and his work consists of planning other new exhibits of a wildlife nature in the State Exhibits Building as well as lecturing and other educational work for the Department in that area.

PUBLICATIONS

During the past biennium three important publications on subjects of vast interest and importance to Louisiana citizens have been reissued. These are "Common Birds of Louisiana", a booklet especially adapted for schools; a publication on "Fur Bearing Animals of Louisiana", and one on "Fishes and Fishing in Louisiana".

Booklets on Louisiana's vast shrimp industry and a fishing guide for the state to meet the enormous demand from tourists and Louisiana citizens are also vitally needed and considerable progress has been made on compiling such publications.

MOTION PICTURE SECTION

The Division's film loan service is continuing to meet with tremendous response throughout the State, and is an important part of educational services being rendered. The film library is constantly being increased. Some of the motion pictures have been made in Louisiana but no new ones have been made in the past two years. However, many new motion pictures on suitable conservation subjects applying to Louisiana have been purchased.

The Library today contains 52 films on various conservation subjects and at least two prints of each subject is available for simultaneous distribution. These films are loaned to schools, sportsmen clubs and other groups in the State, upon request. During 1946 and 1947 these films were shown to more than 1500 groups, schools, sportsmen organizations and civic organizations throughout the state.

A catalogue of motion picture films available through this Division has been published and has been sent to all schools and sportsmen groups for easy reference in requesting films.

INFORMING THE PUBLIC

During the past biennium many thousands of inches of articles and news stories pertaining to the activities of this Department and wildlife conservation in general have appeared in the weekly and daily newspapers in the State. Our relations with the press of the State has been is on a very cordial basis and we have complied with requests from individual newspapers for special articles and pictures on special occasions.

This Division also acts as a general clearing house for information for the entire Department. Inquiries of almost every type imaginable come in almost every day over the telephone, by wire and through the mail. During the fall and winter, especially, there are numerous requests from school children and school teachers for literature and information on various conservation subjects. This Division has received and answered as many as 200 inquiries in one week.

MONTHLY MAGAZINE

Another important means of informing the general public is through the medium of a monthly magazine now known as "Louisiana Game, Fur and Fish", which now has a monthly circulation of 19,000. There is no subscription fee and the publication is mailed upon request to anyone interested in Louisiana wildlife conservation. Members of sportsmen clubs, schools and libraries are among those on the mailing list.

The magazine is intended to supplement information and news made available to Louisiana newspapers, and at the same time serve as a vehicle for educational features on wildlife conservation. The magazine in its present economic size is now in its sixth year. It is not elaborate and the cost of publishing it is held to a minimum.

The costs of publishing and mailing the magazine was further reduced in 1947 when through the efforts of the National Association of Conservation Education and Publicity, of which the director of this Division had the privilege of serving as President, a bill was passed by Congress which made this publication as well as similar conservation publications eligible to second class mailing privileges, which heretofore had been denied them. The National Association of Conservation Education and Publicity is an organization composed of conservation education and publicity personnel of the various Conservation and Fish and Game Departments in the nation and through the efforts of this group, Congress was prevailed upon to extend second class mailing privileges to conservation publications. Whereas under the old permit system, the costs of mailing our monthly publication amounted to about $150 per month, the cost is now down to about $50, and the difference can be used to making more issues available each month to more of our people.

JUNIOR WILDLIFE CLUBS

Conservation education took a tremendous leap forward with the introduction of Junior Wildlife Clubs in Louisiana high schools during the past two years.

Primarily, the organization was formed to promote interest among our future citizens in the myriad of native birds, fish and fur-bearing animals within the state. The ultimate objective, naturally, was for a popular approval of conservation laws, rules and regulations, a thing which could be brought about only through instruction, a time-proven plan of education.

Before going into all of the purposes of the organization we list herewith the clubs formed during the school years of 1946-47 and 1947-48:

1946-47
Alexandria (Bolton Hi)
Bastrop
Baton Rouge
Covington
Hahnville
Istrouma
Kentwood
Lake Providence
Leesville
Maurepas
Oak Grove
Opelousas
Pontchatoula
Shreveport (Byrd Hi)

1947-48
Albany
Benton
Coushatta
Crowley
Denham Springs
Eunice
Franklinton
Hammond
Holden
Independence
Loranger
Le Rode
Madisonville
Mandeville
Martin
Rodessa
Sulphur
Werner Park
Shreveport (Fair Park)

Clubs are generally composed of boys ranging in ages from twelve to 18 years; however, during the 1947-48 school year, a new policy—that of allowing girls to become members—was adopted. Fair Park High school, Shreveport, was the first instance where the co-educational plan was placed in effect, and members of the fairer sex copped three of the four offices in the club.

Another departure from the original constitutional setup took place at Sulphur, where a Junior Wildlife Club was organized among Boy Scouts attending the monthly Court of Honor. Club members meet following the Court of

Honor, and it is expected that both organizations will profit by such cooperation.

A streamlined nine-month program is now in effect, with meetings held during one hour each month. Members learn the rules, regulations and laws pertaining to wildlife conservation within the state; bird, animal and fish identification; how to tell the difference between poisonous and non-poisonous snakes; safety rules to be observed while handling firearms; and above all, the reasons why it is mandatory for Louisiana's citizens to encourage strict observation of all its wildlife regulations.

In addition to classroom instruction, club members—"Junior Sportsmen"—get first hand information about wildlife through field trips, under the guidance of their counsellors. Also, they may participate in any number of auxiliary projects, such as constructing and maintaining fish ponds, rehabilitating birds and other forms of wildlife, and by planting natural cover—such as shrubs and trees—on portions of farmland for the benefit of small game.

Responsibility for the continued interest of club members rests largely on the shoulders of the club counsellor, who is in most cases a prominent citizen imbued with the concepts of true sportsmanship in conservation. Admittedly, such persons exist in large numbers, however, it is often quite difficult to obtain their cooperation since the task naturally requires some sacrifice on the part of a counsellor.

Most of the clubs organized to date have memberships averaging fifty or more "Junior Sportsmen". Some of the larger schools include memberships up to 200, while on the other hand, a few of the small, rural clubs consist of perhaps no more than 25 members.

It is the firm belief of this division that true conservation practices, with a natural resulant improvement in the number of game fur bearing animals and fish in the state, can be obtained through the formation of such clubs. It is the ultimate goal to place a club in every high school in the state. That in itself is a tremendous task, one to tax the ingenuity of the most diligent organizer. However, once such an objective is attained, conservation of our wildlife will be a natural aftermath. and the state, its citizens and visitors will profit immeasurably.

ENFORCEMENT DIVISION

JOHN G. APPEL, *Director*

This report of the Enforcement Division covers the period beginning January 1, 1946, and ending December 31, 1947.

Functions of the Division are the enforcement of all laws protecting the wildlife, seafood and fur bearing resources of the State of Louisiana. The Division is subdivided into three sections, namely: Director's Office, Waterways Section and Inland Section. Each section has its particular duties to perform.

The Director's Office supervises and coordinates the activities of both Waterways and Inland Sections, and maintains all records of the personnel, equipment, field activities, court cases and dispositions of same. It also maintains public relations with individuals or associations interested in the protection of wildlife resources of the State. It inspects all processing plants of the commercial distributors of our seafoods and the refrigeration and storage space of all bird, water fowl, game and seafood resources of the State.

The Waterways Section is composed of a fleet of large and small boats which are used in patrolling the coastal waters and larger lakes and rivers of the State. In order to maintain this equipment in the best possible repair, a boat wharf with a complete machine and carpenter shop is maintained and is managed by a Wharf Superintendent and the necessary Mechanics, Carpenters and Watchmen. This patrolling equipment is used in conjunction with our sea planes, which adds greatly to the efficiency of our patrols and the enforcement of the conservation laws of the State.

The Inland Section is composed of the Wild Life Enforcement Agents assigned to the various parishes and the rangers who operate over the entire State. This section is charged with law enforcement on all inland lakes, streams and woodland, and is divided into six districts. A Supervisor is in charge of each District and is responsible for the activities of the Agents in his district. The Rangers operate under the direct supervision of the Director's Office, functioning wherever necessary in any and all parts of the State and assisting the District Supervisors in any way necessary.

Due to the rapid increase of the processing and distributing of our seafood resources, this Division is in need of considerable expansion. In order to properly inspect and supervise this branch of our enforcement work, both personnel and equipment should be greatly increased.

In addition to the Inland Section and Waterways Section, the following report covers the activities of the Aviation Section in connection with Enforcement:

In the Fall of 1940, the Department of Conservation decided to experiment with the use of aeroplanes, or to be more exact a seaplane, in the enforcing of the regulations of the Department, particularly the regulations of the Enforcement Division.

The services of a pilot, along with the use of the pilot's seaplane, was secured and put to work on December 1, 1940 on a trial basis with the understanding that the service would have to be proven to be of worth to the Department before it could become a permanent arrangement or service.

From that humble beginning, the demand for increasing service has grown until today the Department operates three amphibious type planes, with the services of two pilots, for all Divisions of the Department.

The Enforcement Division being the first to purchase a plane quite naturally has the largest number of flying hours to its credit, a total of 3383 hours since the inauguration of the service, with 942 hours of that being flown since January 1, 1947 at which time the services of a second pilot was secured.

It might be pointed out at this time that until the Department owned more than one plane the pilot maintained and repaired the plane in addition to his other duties, but with the acquisition of additional equipment the services of a mechanic was required, since the first pilot necessarily

A "flying" enforcement agent checking a boat.

had to supervise all flying activities. The mechanic was employed in the late Fall of 1946 after the purchase of the second plane.

In the beginning of the use of seaplanes by the Department, the work was purely that of observation for the Enforcement Division. Flights were made over the different areas and if any violations were noted, they were reported to the Director who would send one of the Division's boats with agents aboard to make the investigations or arrests as need be.

As the reader has probably surmised, this procedure did not work very long because the violators soon became aware of the fact that their activities in the area, where the plane flew over them, was being reported to the Director's Office for they were apprehended shortly thereafter, each time by the Department's boats. They soon learned to move to some other area after the plane was out of sight.

It then became necessary for the plane pilot to work out some other method of working the problem. So for several years boats of the Enforcement Division were sent to areas, of known violations, where the plane would meet them and direct their activities, as well as boarding such boats as was possible to do so directly from the plane by an agent accompanying the pilot of the plane.

This method worked with varying success for several years, but became obsolete with the advent of larger boats in our fishing waters. The fishing boats were larger, more powerful and much faster than the equipment operated by the Department so it became a simple matter of hoisting gear and outrunning the Department's boats after the violator was spotted by the plane or vice versa.

Confronted with this problem, the Department decided to make another change, this time to the use of a small, thoroughly seaworthy, extremely fast, boat that would be able to operate, from the larger Department's boats, as a base. A move in that direction was made by building one boat at the Department's wharf for this purpose. It worked with such success that another small boat was acquired soon for work on the opposite side of the river.

The use of the small fast boats working with the planes met with so much success during the closed shrimp season of that year, 1945, that violations were kept to the lowest levels in the history of the Department.

The year 1946 brought still another problem that had to be overcome, a great percentage of the fishing fleet began installing radio equipment, with which they could communicate with one another which enabled easy warning from one boat to others. This was immediately combated by a change in flight procedures, and mainly by the use of radio equipment borrowed by the Department.

At the beginning of the 1946 summer closed season on shrimp, the Department of Wild Life and Fisheries borrowed four radio sets from the Department of Safety; two were installed in planes and two were installed in the small fast boats. With this arrangement working very successfully, violations were kept to still lower levels.

Other phases of Enforcement Division work, capable of being done and some of it being done at present by plane, consists of checking all types of licenses issued to boats, by the Department, checking of trappers' licenses in accessible areas, illegal hunting, particularly wild fowl, in the water areas, illegal trapping, during closed season, in the marsh areas, and various others that arise from time to time, some mention of which is made later.

No claim is made whatsoever as to the value of the planes in the Enforcement work over the land areas of the State, except in a psychological way, although there have been many instances, of a very tangible nature, where they have been used even in the northern tier of Parishes, particularly along the rivers and lakes of that part of the State.

No mention has been made until now of the actual use by the Public of the planes, although approximately ten (10%) per cent of the total hours flown by the planes are done directly for the Public, in performing various services for individuals such as the rescue work immediately following the September hurricane, work done during the 1945 floods, numerous searches for lost and drowned persons, searches for boats on which there are persons who have had deaths in their family at home, searches for lost boats or boats overdue in their home port, assistance given various Federal Agencies and also work done for other State Agencies.

The following report of arrests will reflect a portion of the activities in the enforcement of the Conservation Laws of the State. It will be noted from the record printed hereon that some Judicial Districts are rather slow of disposing cases placed in their courts. It will also be noted that since the act making it possible to dispose of violations in the Justice of the Peace courts went into effect in August 1946 there is a very small number of cases pending. In other words, out of a total number of 1700 cases tried in Justice of the Peace courts all but 14 cases have been disposed of, and they will be disposed of shortly.

PARISH	1946								1947							
	Judicial Dist.	Number of Arrests	Number in Dist. Court	Number Pending in Dist. Court	Number Arrest in J. P. Court	Number Convictions in J. P. Court	No. Pending J. P.	Civil Judgments collected in J. P. Court	Judicial Dist.	Number of Arrests	Number in Dist. Court	Number Pending in Dist. Court	Number Arrest in J. P. Court	Number Convictions in J. P. Court	No. Pending J. P.	Civil Judgments collected in J. P. Court
Caddo	1	10	6	0	4	4	0	62.50	1	6	6	0	0	0	0	00.00
Total		10	6	0	4	4	0	62.50		6	6	0	0	0	0	00.00
Bienville	2	11	4	0	7	7	0	125.00	2	9	3	3	6	5	1	50.00
Claiborne	2	7	1	0	6	6	0	112.50	2	18	14	0	4	4	0	87.50
Jackson	2	8	0	0	8	8	0	125.00	2	10	0	0	10	10	0	125.00
Total		26	5	0	21	21	0	362.50		37	17	3	20	19	1	262.50
Lincoln	3	16	16	3	0	0	0	00.00	3	11	11	0	0	0	0	00.00
Union	3	7	7	4	0	0	0	00.00	3	11	6	1	5	5	0	100.00
Total		23	23	7	0	0	0	00.00		22	17	1	5	5	0	100.00
Morehouse	4	29	18	6	11	11	0	162.50	4	13	3	2	10	10	0	387.50
Ouachita	4	54	2	1	52	52	0	612.50	4	34	4	1	30	29	1	462.50
Total		83	20	7	63	63	0	775.00		47	7	3	40	39	1	850.00
Franklin	5	18	8	2	10	10	0	112.50	5	4	4	4	0	0	0	00.00
Richland	5	15	9	0	6	6	0	100.00	5	18	0	0	18	18	0	312.50
W. Carroll	5	9	1	1	8	8	0	100.00	5	6	0	0	6	6	0	112.50
Total		42	18	3	24	24	0	312.50		28	4	4	24	24	0	425.00

E. Carroll	6	20	15	1	5	5	0	62.50	6	19	19	0	0	0	0	00.00
Madison	6	118	117	43	1	1	0	12.50	6	12	12	6	0	0	0	00.00
Tensas	6	49	49	28	0	0	0	00.00	6	15	15	15	0	0	0	00.00
Total		187	181	72	6	6	0	75.00		46	46	21	0	0	0	00.00
Catahoula	7	40	8	6	32	32	0	427.50	7	28	3	0	25	25	0	400.00
Concordia	7	48	6	2	42	42	0	587.50	7	44	4	0	40	40	0	700.00
Total		88	14	8	74	74	0	1,015.00		72	7	0	65	65	0	1,100.00
Grant	8	28	2	1	26	26	0	400.00	8	8	3	0	5	5	0	100.00
Winn	8	17	0	0	17	16	1	297.50	8	2	2	0	0	0	0	00.00
Total		45	2	1	43	42	1	697.50		10	5	0	5	5	0	100.00
Rapides	9	21	19	6	2	2	0	12.50	9	12	7	1	5	5	0	125.00
Total		21	19	6	2	2	0	12.50		12	7	1	5	5	0	125.00
Natchitoches	10	15	0	0	15	15	0	212.50	10	7	0	0	7	7	0	75.00
Red River	10	13	0	0	13	13	0	162.50	10	7	2	2	5	5	0	87.50
Total		28	0	0	28	28	0	375.00		14	2	2	12	12	0	162.50
DeSoto	11	6	1	0	5	5	0	62.50	11	0	0	0	0	0	0	00.00
Sabine	11	8	0	0	8	7	1	80.00	11	6	0	0	6	6	0	112.50
Vernon	11	30	0	0	30	30	0	512.50	11	6	0	0	6	6	0	112.50
Total		44	1	0	43	42	1	655.00		12	0	0	12	12	0	225.00
Avoyelles	12	29	2	2	27	26	1	235.00	12	17	5	5	12	11	1	175.00
Total		29	2	2	27	26	1	235.00		17	5	5	12	11	1	175.00

PARISH	1946								1947							
	Judicial Dist.	Number of Arrests	Number in Dist. Court	Number Pending in Dist. Court	Number Arrest in J. P. Court	Number Convictions in J. P. Court	No. Pending J. P.	Civil Judgments collected in J. P. Court	Judicial Dist.	Number of Arrests	Number in Dist. Court	Number Pending in Dist. Court	Number Arrest in J. P. Court	Number Convictions in J. P. Court	No. Pending J. P.	Civil Judgments collected in J. P. Court
Evangeline	13	4	0	0	4	4	0	50.00	13	1	0	0	1	1	0	12.50
Total		4	0	0	4	4	0	50.00		1	0	0	1	1	0	12.50
Allen	14	6	1	1	5	5	0	62.50	14	6	2	2	4	4	0	50.00
Beauregard	14	10	0	0	10	10	0	200.00	14	2	1	0	1	1	0	25.00
Cameron	14	26	3	3	23	23	0	350.00	14	16	0	0	16	16	0	225.00
Calcasieu	14	14	4	0	10	10	0	137.50	14	16	0	0	12	12	0	112.50
Jefferson Davis	14	0	0	0	0	0	0	00.00	14	1	0	0	1	1	0	12.50
Total		56	8	4	48	48	0	750.00		41	3	2	34	34	0	425.00
Acadia	15	0	0	0	0	0	0	00.00	15	3	0	0	3	3	0	37.50
Lafayette	15	2	0	0	2	2	0	50.00	15	0	0	0	0	0	0	00.00
Vermilion	15	21	0	0	21	21	0	262.50	15	13	0	0	13	13	0	150.00
Total		23	0	0	23	23	0	312.50		16	0	0	16	16	0	187.50
Iberia	16	6	0	0	6	3	3	50.00	16	21	0	0	21	21	0	262.50
St. Martin	16	9	0	0	9	9	0	125.00	16	2	0	0	2	2	0	25.00
St. Mary	16	17	3	3	14	14	0	205.00	16	12	0	0	12	12	0	150.00
Total		32	3	3	29	26	3	380.00		35	0	0	35	35	0	437.50
Lafourche	17	29	11	9	18	18	0	300.00	17	11	2	2	9	9	0	125.00
Terrebonne	17	50	7	7	43	43	0	1,325.00	17	14	0	0	14	14	0	387.50
Total		79	18	16	61	61	0	1,625.00		25	2	2	23	23	0	512.50

Iberville	18	42	6	3	36	36	0	475.00	18	22	3	0	19	18	1	350.00
Pointe Coupee	18	36	0	0	36	36	0	425.00	18	20	0	0	20	20	0	235.00
W. Baton Rouge	18	19	0	0	19	19	0	237.50	18	5	0	0	5	5	0	62.50
Total		97	6	3	91	91	0	1,137.50		47	3	0	44	43	1	647.50
E. Baton Rouge	19	24	1	0	23	23	0	300.00	19	25	0	0	25	25	0	350.00
Total		24	1	0	23	23	0	300.00		25	0	0	25	25	0	350.00
E. Feliciana	20	3	1	0	2	2	0	25.00	20	2	0	0	2	2	0	25.00
W. Feliciana	20	10	0	0	10	10	0	125.00	20	10	0	0	10	10	0	125.00
Total		13	1	0	12	12	0	150.00		12	0	0	12	12	0	150.00
Livingston	21	11	5	0	6	6	0	97.50	21	11	0	0	11	11	0	137.50
St. Helena	21	0	0	0	0	0	0	00.00	21	0	0	0	0	0	0	00.00
Tangipahoa	21	25	16	9	9	9	0	72.50	21	33	20	11	13	13	0	162.50
Total		36	21	9	15	15	0	170.00		44	20	11	24	24	0	300.00
St. Tammany	22	57	19	19	38	38	0	487.50	22	123	2	2	121	121	0	1,612.50
Washington	22	19	0	0	19	19	0	450.00	22	12	0	0	12	12	0	162.50
Total		76	19	19	57	57	0	937.50		135	2	2	133	133	0	1,775.00
Ascension	23	22	0	0	22	22	0	275.00	23	8	0	0	8	7	1	87.50
Assumption	23	12	0	0	12	12	0	162.50	23	2	0	0	2	2	0	25.00
St. James	23	17	0	0	17	17	0	237.50	23	7	3	3	4	4	0	62.50
Total		51	0	0	51	51	0	675.00		17	3	3	14	13	1	175.00
Jefferson	24	57	23	20	34	33	1	725.00	24	35	0	0	35	35	0	437.50
St. Charles	24	24	0	0	24	24	0	325.00	24	22	1	1	21	21	0	262.50
St. John	24	15	5	5	10	10	0	137.50	24	40	6	6	34	33	1	412.50
Total		96	28	25	68	67	1	1,187.50		97	7	7	90	89	1	1,112.50

PARISH	1946								1947							
	Judicial Dist.	Number of Arrests	Number in Dist. Court	Number Pending in Dist. Court	Number Arrest in J. P. Court	Number Convictions in J. P. Court	No. Pending J. P.	Civil Judgments collected in J. P. Court	Judicial Dist.	Number of Arrests	Number in Dist. Court	Number Pending in Dist. Court	Number Arrest in J. P. Court	Number Convictions in J. P. Court	No. Pending J. P.	Civil Judgments collected in J. P. Court
Plaquemines	25	34	13	13	21	21	0	237.50	25	25	0	0	25	25	0	387.50
St. Bernard	25	45	36	36	9	9	0	37.50	25	36	1	1	35	34	1	425.00
Total		79	49	49	30	30	0	275.00		61	1	1	60	59	1	812.50
Bossier	26	7	0	0	7	7	0	100.00	26	5	0	0	5	5	0	125.00
Webster	26	6	0	0	6	6	0	150.00	26	7	0	0	7	7	0	162.50
Total		13	0	0	13	13	0	250.00		12	0	0	12	12	0	287.50
St. Landry	27	36	0	0	36	36	0	500.00	27	37	0	0	37	37	0	425.00
Total		36	0	0	36	36	0	500.00		37	0	0	37	37	0	425.00
La Salle	28	20	0	0	20	20	0	312.50	28	14	0	0	14	14	0	180.00
Caldwell	28	7	7	0	0	0	0	00.00	28	13	3	3	10	10	0	262.50
Total		27	7	0	20	20	0	312.50		27	3	3	24	24	0	442.50
Orleans Criminal District Court		101	101	100	0	0	0	00.00		11	11	11	0	0	0	00.00
Total		101	101	100	0	0	0	00.00		11	11	11	0	0	0	00.00

SUMMARY OF ALL JUDICIAL DISTRICTS

Number of Arrests Ending June 30, 1947	1,469
Number of Arrests from July 1 to December 31, 1947	966
Total	2,435
Number of cases in District Court ending June 30, 1947	452
Number of cases in District Court from July 1 to December 31, 1947	178
Total	630
Number of cases Pending in District Court ending June 30, 1947	334
Number of cases Pending in District Court from July 1 to December 31, 1947	82
Total	416
Number of cases in J. P. Court ending June 30, 1947	916
Number of cases in J. P. Court from July 1, to December 31, 1947	784
Total	1,700
Number of convictions in J. P. Court ending June 30, 1947	909
Number of convictions in J. P. Court from July 1 to December 31, 1947	777
Total	1,686
Number Pending in J. P. Court ending June 30, 1947	7
Number Pending in J. P. Court from July 1 to December 31, 1947	7
Total	14
Civil Judgments collected in J. P. Court ending June 30, 1947	$13,590.00
Civil Judgments collected in J. P. from July 1 to December 31, 1947	11,577.50
Total	$25,167.50

NOTE: The above summary does not include 248 Migratory Cases tried in Federal Court.

PRODUCTION AND VALUATION OF FRESH AND SALT WATER FISHES

FRESH WATER FISHERIES:

	1946 Production	Value
Catfish	4,558,635 Lbs.	$ 797,761.12
Gaspergou	1,578,463 Lbs.	284,123.34
Spoonbill	143,038 Lbs.	39,335.45
Buffalo	3,027,884 Lbs.	529,879.70
Fresh Water Turtles	107,711 Lbs.	16,156.65
Miscellaneous	452,349 Lbs.	67,852.35
Frogs	327,170 Lbs.	49,075.50
Fresh Water Shrimp	51,620 Lbs.	20,648.00
Crabmeat	1,396,928 Lbs.	1,396,928.00
Crawfish	485,619 Lbs.	77,699.04
	12,129,417 Lbs.	$ 3,279,459.15
Hard Shell Crabs	1,786,476 Doz.	893,238.00
Soft Shell Crabs	529,160 Doz.	158,748.00
"Baby" Green Turtles	2,814,275 Turtles	56,285.50
Total Value		$ 4,387,730.65

N. B. Most of the production in miscellaneous fisheries was garfish and carp, which are now considered commercial fisheries.

50% of the production of hard shell crabs was used for canning purposes.

SALT WATER FISHERIES:

	1946 Production	Value
Catfish	149,675 Lbs.	$ 22,451.25
Speckled Sea Trout	274,382 Lbs.	102,893.25
Red Fish	143,648 Lbs.	71,824.00
Sheepshead	121,658 Lbs.	24,331.60
Flounders	95,004 Lbs.	15,200.64
Common Salt Water Fish	625,591 Lbs.	62,559.10
Snappers	371,460 Lbs.	74,292.00
Salt Water Turtles	36,090 Lbs.	7,218.00
	1,817,508 Lbs.	$ 380,769.84
Terrapins	326 Doz.	3,912.00
		$ 384,681.84
Total Value Fresh Water Fisheries		$ 4,387,730.65
Total Value Salt Water Fisheries		384,681.84

FRESH WATER FISHERIES:

	1947 Production		Value
Catfish	4,753,944	Lbs.	$ 950,788.80
Gaspergou	1,533,109	Lbs.	306,621.80
Spoonbill	93,655	Lbs.	28,096.50
Buffalo	3,146,606	Lbs.	629,321.20
Fresh Water Turtles	125,921	Lbs.	25,184.20
Miscellaneous	431,248	Lbs.	86,249.60
Frogs	269,297	Lbs.	40,394.55
Fresh Water Shrimp	48,462	Lbs.	19,389.80
Crabmeat	1,005,441	Lbs.	1,005,441.00
Crawfish	380,863	Lbs.	76,172.60
Gar	229,204	Lbs.	34,380.60
	12,017,750	Lbs.	$ 3,202,040.65
Hard Shell Crabs	1,596,575	Doz.	1,197,431.25
Soft Shell Crabs	65,462	Doz.	196,896.00
Turtles	312,067	Turtles	9,362.01
Total Value			$ 4,605,729.91

N. B. Most of the production in miscellaneous fisheries was carp, which are now considered commercial fisheries.

50% of the production of hard shell crabs was used for canning purposes.

SALT WATER FISHERIES:

	1947 Production		Value
Catfish	104,260	Lbs.	$ 20,852.00
Speckled Sea Trout	411,480	Lbs.	164,592.00
Red Fish	382,240	Lbs.	229,344.00
Sheepshead	118,097	Lbs.	29,524.25
Flounder	97,951	Lbs.	17,625.18
Common Salt water Fish	808,316	Lbs.	121,247.40
Snappers	283,458	Lbs.	70,864.50
Salt Water Turtles	44,889	Lbs.	8,977.80
	$ 2,250,691	Lbs.	$ 663,027.13
Terrapins	329	Doz.	3,948.00
Total Value			$ 666,975.13

The above values are at the fishing grounds, i.e., prices paid to the commercial fishermen, which value becomes augmented as the product is passed on to dealers, retailers and finally to the consumers.

PRODUCTION OF LOUISIANA SALT WATER SHRIMP

@210 Pounds Per Barrel

	BARRELS	
	1946	1947
Sold in green state in Mississippi for processing and headless	61,702	49,352
Sold through New Orleans French Market in green state—heads on	37,048	28,565
Sold in green in state in Louisiana—heads on	39,312	37,579
Sold in green state as headless in Louisiana	185,243	148,319
Sold in green state for canning and packing	84,028	64,374
Sold in green state for drying	47,432	23,725
Sold in green state as whole shrimp processed as cooked and peeled	10,213****	13,700
TOTAL	464,980	365,617

**** The disposition of shrimp was not reported and recorded as **cooked and peeled** until September 1946.

DIVISION OF FISH AND GAME

MAJOR JAMES BROWN, *Director*

The activities of this Division have been greatly increased during this biennium. The following report covers the fifteen sections now comprising this Division:

Director's Office—New Orleans
Biological Research—New Orleans
Hyacinth Control—Statewide
Fish Rescue—Statewide
L. S. U. Quail Hatchery—Baton Rouge
Lacombe Quail Hatchery—Lacombe
Lacombe Fish Hatchery—Lacombe
Monroe Fish Hatchery—Monroe
Beechwood Fish Hatchery—Forest Hill
Lake Bruin Fish Preserve—St. Joseph
Northwest La. Fish & Game Preserve—Natchitoches
Lake Bistineau Fish & Game Preserve—McDade
Catahoula Lake Sanctuary—Deville
Pittman-Robertson (Federal Aid)
Predator Control—Statewide

The 1946 Legislature appropriated $200,000.00 from Wild Life and Fisheries funds to commence a program for the eradication of water hyacinth and alligator grass. These two aquatic plants have become a serious menace in the waters of the State. J. Nelson Gowanloch, our Chief Biologist, assisted in the field by Dr. A. D. Bajkov, has initiated a thorough research project in conjunction with Owen Edwards, Supervisor of the Hyacinth Control field work. Fourteen men operate power sprayers, cutters, a fleet of five trucks, boats, barges, and outboard motors in year 'round eradication program. A complete report of their activities appears later.

The Predator Control section was set up in August under Supervisor Joe Miller, a former Federal trapper from the U. S. Fish and Wildlife Service. During the war, with so many of our men in the Armed Forces and scarcity of ammunition, the predators increased all over the State. It is hoped and expected that the results from this program will bring back all predators into proper balance. This program is not intended to attempt the complete eradication of all predators, but rather to reduce the predators to proper numbers in the sections of the State where their increase has brought heavy losses to our wildlife and to property.

The Fish Rescue crew, supervised by Bert Oldham, have increased their operations. A new eighteen can aerated Live Fish Transport truck has been added to their fleet of trucks. The total weight of fish rescued and distributed throughout the State increased from 16,759 pounds in 1946 to 39,155 pounds in 1947.

The two quail hatcheries produced 5,231 quail in 1946 and approximately 4,800 in 1947. The hurricane in 1947 caused losses of over 1,000 quail in the two hatcheries. No distribution of quail was made in the fall of 1947. The entire 4,800 quail have been carried through the winter and will be distributed this spring during April and May.

The Federal Aid program for the restoration of our wildlife through Pittman-Robertson projects appears later in this report. Funds available to Louisiana from the Federal Government have been greatly increased. In 1946 our allotment was $12,946.09; in 1947 it was $35,275.28; and for 1948 we have $133,931.68. This increase will allow a development program to be started based on the research projects that have been completed in the period from 1941 to 1947. John S. Campbell, State Co-ordinator, has supervision of all Pittman-Robertson projects aided by eight biologists.

The great increase in the numbers of hunters and fishermen has brought a serious problem to this Division. The development and restoration of all available areas of land and water is absolutely necessary to assure public fishing and hunting for the years before us. The great changes that have occurred in land use, the cutting of our forests, and the

Water Hyacinths in bloom.

great industrial development that is occurring all over Louisiana have destroyed vast areas that formerly carried large populations of game and fish. Modern roads and transportation have made available every section of Louisiana to a vastly increased army of hunters and fishermen. To supply the fish and game for the public in future years, will require the intelligent cooperation of all our people. No longer can we expect to have unrestricted and unregulated hunting and fishing; but if all of our people will always remember the Conservation Pledge:

"I GIVE MY PLEDGE AS AN AMERICAN TO SAVE AND FAITHFULLY TO DEFEND FROM WASTE THE NATURAL RESOURCES OF MY COUNTRY—ITS SOIL AND MINERALS, ITS FORESTS, WATERS, AND WILDLIFE."

then can the program of this Division perpetuate and increase the wildlife resources of Louisiana.

WATER HYACINTH PROGRAM

By

James Nelson Gowanloch and Alexander D. Bajkov

INTRODUCTION

The water hyacinth, commonly known as "water lily," is without doubt the worst biological problem that the State of Louisiana at present faces. This plant, which was introduced into Louisiana from South America seventy years ago, has spread not only over the State but now thrives in appropriate waters throughout the United States south of the line drawn from Los Angeles, California, to Savannah, Georgia. It has been known to survive the winter as far north as Washington, D. C., and has been known to occur as far north as North Carolina. The federal government of the United States in consultation with state agencies has conservatively estimated that the water hyacinth costs, in the State of Louisiana alone, an annual loss of between sixty-five and seventy-five million dollars every year.

Water hyacinth completely ruins wildlife resources. Covering streams, it ruins the finest fishing waters by blocking out light, destroying sub-aquatic vegetation, preventing the production of needed fish foods for both commercial and game fish species so that all game and commercial fish in completely hyacinth-infested waters either starve or move away.

Even where water hyacinth has not completely blocked out areas, the presence of the large drifting mats makes fishing not only difficult but definitely dangerous. Lake Concordia, once one of our finest fishing lakes, became infested by water hyacinth until two-thirds of its area was covered by drifting mats. Fishermen, venturing out on this body of water, were often caught in drifting masses of water hyacinth and compelled to stay out all night as food for mosquitoes. What happened to the water hyacinth in Lake Concordia as a result of the progress of water hyacinth elimination, described in this report, will be later stated. It is sufficient here to say that Lake Concordia is again open water and its fishing values are restored.

Water hyacinth hits further at the very basis of the economic life of Louisiana. Space here permits only the enumeration of some of the types of disastrous damage it causes.

(1) Wildlife fisheries resources as already indicated.

(2) Wildlife waterfowl resources. Water hyacinth can completely block out desirable waterfowl wintering grounds. Useless as food for ducks or geese, it destroys useful waterfowl food plants. Furthermore, the drifting mats of water hyacinth tear up and completely destroy thriving beds of valuable duck and goose foods. Invasion of once fine duck hunting grounds results, unless the water hyacinth is checked, in the complete destruction of such areas. An impenetrable mat is formed. Ducks and geese cannot even alight in such waters much less feed.

(3) Drainage projects costing millions of dollars and the results of at least a century of work have been impaired and in many instances rendered useless. The struggle to maintain water control for the prevention of floods and for maintenance of water supply has been rendered incalculably costly.

(4) Navigation has been impeded and in many streams rendered completely impossible. Since the jurisdiction of the United States Corps of Engineers originally covered only navigable waters, there exist areas of Louisiana in which citizens had to abandon their life time equities because their homes and recreational fishing businesses (rental of boats, sale of bait, rental of camps and similar activities and in other cases, their own activities as commercial fishermen) have been completely obliterated.

(5) The activities of lumbering concerns have been gravely impaired. One example may be cited. A company that proposed to harvest a $5,000.00 crop of cypress lumber was compelled to spend the sum of $2,500.00 in getting rid of water hyacinth before they could even bring out a single board foot. Business on such terms is obviously impossible.

(6) The activities of oil companies have been profoundly affected. First, exploration seismographic crews have been unable to get into the areas where they have to

set up their technical equipment. Second, when drilling operations are begun, the canals necessary for access become blocked and a constant expenditure is essential to maintain even minimum communications. Third, when production begins, the transfer of personnel and of the oil itself is rendered excessively expensive because of blocking of canals by water hyacinth. One example may be cited. A single small operation in Jefferson Parish involved for a single, private operator of some of the chartered boats concerned, a loss of between $400.00 and $500.00 a month in burned-out motors plus all the additional trouble caused by delays in the endeavor to maintain boat service for personnel and supplies to the producing field.

(7) The existence of a serious hazard to human life has been demonstrated a number of times in Louisiana where fishermen, endeavoring to force their way through water hyacinth rafts have fallen overboard and drowned beneath these masses of vegetation. Another example occurred when two passengers of a car that plunged from a highway into a water hyacinth-covered canal were drowned because rescuers could not locate the position of the accident due to the masses of water hyacinth.

It is obvious that the best way to get rid of a pest is to find some economically valuable use for it, thus making the control and destruction of such a pest a profitable enterprise. The most careful investigations conducted in many parts of the world have entirely failed to reveal any commercial use for water hyacinth. Letters appear from time to time in newspapers, written by uninformed people who have heard third or fourth hand that water hyacinth can be made into paper, into wallboard, into house insulation or, most remarkable of all, into extraordinarily valuable filters for use in the process of refining sugar. All these ideas are without basis in the fact and such letters merely confuse the public understanding of this most serious Louisiana problem.

Briefly stated, the Fish and Game Division of the Louisiana Department of Wild Life and Fisheries has entered upon a program directed not for the control of water hyacinth but for the extermination of this plant. This seems to be an impossibly big order but it can be stated that the results of the investigations conducted by this division make possible such a statement after careful consideration. The problem is not solved as will be presently indicated but we are well on the way to solve it.

It is now necessary to review briefly the attempts to control water hyacinth. As early as 1890, an agitation was begun in Congress to appropriate money to experiment in water hyacinth control. Seven years later, such an appropriation was made. Since that time the federal government has spent in the State of Louisiana alone at least several million dollars in water hyacinth control programs. The agency carrying out these operations has been the U. S. Corps of Engineers. The problem involved had relatively a simple objective, namely, keeping waterways clear for navigation. Non-navigable waters, back waters, fishing areas, both commercial and sport, effects on drainage programs and effects on waterfowl resources, were not part of such program.

Two methods were used. First, the employment of arsenical poisons sprayed on the plants to destroy them. It must be here emphasized that the State of Louisiana never, at any time, used such poisons. The use of these poisons were abandoned by the federal government in 1937.

Much earlier, the federal government, through the U. S. Corps of Engineers, investigated and developed mechanical methods of controlling water hyacinth. Two general types of machines were devised: First, machines that would pick up water hyacinth and deposit them on the banks to die; second, chopping and grinding machines that would tear up the water hyacinth and set the shattered plant remains adrift. Some of these machines were extremely costly, one for example, in use in the New Orleans area, having cost over $100,000.00.

The fact is that in spite of this long program now covering some fifty years, carried out energetically by the U. S. Corps of Engineers, the water hyacinth became worse and worse. The Division of Fish and Game of the Louisiana Department of Wild Life and Fisheries, eight years ago, with the helpful co-operation of the U. S. Corps of Engineers, attempted mechanical control of water hyacinth. Machines were constructed and operated, devised to clear 1500 square yards of hyacinth-covered bayous per hour, and pile the plants on the bank. The great trouble with these machines was the cost of labor operating them although during the period of the war, German prisoner of war labor was utilized. It was necessary to maintain machine at maximum efficiency to use a crew of seven to ten men which became in cost prohibitive.

Five years ago, a truly startling scientific discovery was made, namely, that the application of certain chemical substances hitherto used to stimulate plant growth could, in appropriate higher concentrations, be used to destroy plant growth. The Division of Fish and Game of the Louisiana Department of Wild Life and Fisheries, was in close touch with these developments and realized immediately their possible potential value. Initial experimentation was begun and at the last legislative session an appropriation of $200,000.00 was made for the purpose of the conduct of this work.

Briefly, it is necessary for general understanding of this new method of attacking water hyacinth to indicate something of the scientific background of these immensely, for Louisiana, important discoveries.

It has been learned some fifty years ago that plants themselves produced certain substances later termed "plant hormones," that stimulated the growth of certain parts of the plant structure to increased development. Scientists later discovered that special chemicals could cause similar effects although such chemicals were artificially manufactured. Such chemicals were termed, to be precise, "plant hormone-like substances". Some five years ago, one of these chemicals attracted the attention of scientists interested in killing rather than stimulating plants. This substance, known for easy reference as 2,4-D, is a complicated chemical technically known by the rather appalling name of 2,4-Dichlorphenoxyacetic acid. It can be synthesized by ordinary chemical procedure. The first applications of 2,4-D gave exciting results. It was found that 2,4-D and various combinations obtained from 2,4-D had completely different effects on different types of plants. Grasses were not harmed, broad-leaf plants were killed. Thus, lawns could be rid of dandelions without injuring the grass. Furthermore, and this was a most important point, these 2,4-D chemicals were not "poisons" because in concentrations used, they were not only harmless to man but also completely harmless to all domestic animals and are, still further, completely harmless in concentrations used, to fish life present. It was thus immediately apparent to the Division of Fish and Game of the Louisiana Department of Wild Life and Fisheries, that there was here a possible effective instrument with which to attack water hyacinth.

Initial experiments were conducted which gave promise of great success. A broad program was set up. Step by step, methods of application and kinds of chemicals used were tested and discarded or improved. It can be said that this department was the first in the country to carry on experiments on such a broad scale using individual unit spraying equipment, truck spraying equipment (applicable to bank-side concentrations of water hyacinth), spray boats, combinations of spray boats and saw boats, capable of cutting their way into densely matted vegetation and airplanes equipped with apparatus for dusting a mixture of 2,4-D chemicals and talc dispersants.

It is sufficient in this brief introductory summary to state that this program has proceeded with unexpectedly successful results. It must be made entirely clear to every reader that the complete answers to the water hyacinth problem have not been found but this department, in these researches, has gone far on the road to finding a practical answer which not only is capable of controlling the plant pest but, it is hoped with future modifications of chemicals used and future refinements of various methods of application and various combinations of different methods of application, to not only control water hyacinth but, area by area, to exterminate the plant.

Such a program will be very costly in spite of the fact that due to increasing mass production of the chemicals used, the cost of these chemicals is steadily falling. So great, however, is the damage done by water hyacinth and so inevitable is the complete destruction of some of our state's most valuable wildlife and other resources that, if water hyacinth is not controlled, the cost must be met and the control accomplished.

It should be pointed out now that frost damage to water hyacinth creates the impression of the destruction of water hyacinth beds. This appearance of destruction is a complete illusion since the underwater remaining living parts of the plant quickly resprout and the extensive beds are quickly restored. The program of research conducted by this department has provided adequate and unmistakable means of distinguishing between plants thus damaged and capable of complete recovery and plants killed by 2,4-D and quite dead.

The manner in which 2,4-D and some similar chemicals work is spectacular. It is true that a small drop of the substance measuring, for example, in certain experiments, only one and one twenty-fifth of a hundredth of an inch across, if it strikes a single leaf of water hyacinth plant is capable of killing the entire plant to its furthest root tips. Furthermore, it is also capable of killing plants that have grown from the first plant and are still connected with it: No scientist yet knows how this destruction of the plant is accomplished although a great deal of research is being done upon this problem. It is sufficient for our purposes to state that the death of the plant, provided such contact with the chemical has been accomplished, is sure.

It must be emphasized here that the program of the Division of Fish and Game of the Louisiana Department of Wild Life and Fisheries has been clear cut in its objective, namely, to learn the "know how" of killing water hyacinth as efficiently and cheaply as possible. Many different substances have been used in large scale, carefully controlled experiments. It has been necessary in the efficient conduct of such work to carry out a definite research program in definite controlled areas. This has meant disappointment to many people who, misunderstanding the fundamental purpose of such a program, felt that the department should undertake immediately water hyacinth clearance in their immediate neighborhood. The only successful testing out of such programs and procedures is by careful, persistent and often difficult studies conducted in definite areas where the results can be studied with accuracy. There is no way that the problem of water hyacinth extermination can be attacked except through such careful work. If the plant is to be eliminated, methods must be developed that can be applied, area by area, so that the water hyacinth can be killed at its source. The whole problem of the water hyacinth is by no means yet solved since certain aspects such as the conditions under which hyacinths germinate from seed, the relation of such seedlings to floating rafts and the speed and completeness with which such floating rafts (locally known as "floaton") can be caused to sink and thus clear the water areas of obstructions, all these are of great importance and are under investigation. The fundamentally important thing is that we now possess a practical means of destroying water hyacinth without damaging fish life and without endangering human beings or domestic animals. The cost of unit per area of such chemical operations is tremendously less than former methods of manual removal of water hyacinth and mechanical removal of water hyacinth. When the procedures are worked out they will necessarily include a program of initial attack on the plant by sprayed or dusted chemicals from surface boats or from planes followed by a "mopping up" operation carried out from surface spray boats or a combination of surface saw and spray boats. It is to say the least promising for the success of such programs that in the experiments already conducted by this department, it has been possible to kill as high as 95% of all of the existing water hyacinth present by a single, initial application of effective chemicals. The percentage in some of these experiments has risen to 100%, in other words, total destruction of all water hyacinth present forming the mats, with a single application of the chemical from a plane, or, in some of the experiments, from a surface spray boat. This 100% destruction is not based on any guess but is based upon a most careful statistical study of the plants concerned over a period of time, which studies showed a constantly rising proportion of moribund plants.

It should be here pointed out that one of the many interesting discoveries of these investigations was the fact that such dying plants can actually produce a profusion of normally appearing blossoms. Water hyacinth, in the storage structures known as the rhizomes, can still hold a reserve of food materials such that although the plant is already fatally injured by the application of 2,4-D, it nevertheless bursts into blossom and gives, quite naturally, anyone unfamiliar with these facts the impression that the water hyacinth rafts have actually been unharmed. The present researches have given an infallible method whereby can be shown convincing proof that such a plant is nevertheless doomed to die. Whether or not the seeds produced by such flowering plants are produced and are capable of germinating and forming new water hyacinths, is a problem to which we are now seeking the answers. There remains beyond that inevitably the problem of continued and vigilant maintenance.

Damage done to the stream itself by the subsequent decay of the destroyed plants can, in normal water areas, be regarded as negligible since although such decaying materials do reduce the oxygen present in the water, there are usually actually no useful fish present where the streams have been covered with water hyacinth and only after the water hyacinths have been destroyed and their decay has occurred will the water become habitable for commercial and game fish.

There is no single biological problem of as much importance to Louisiana and the entire south than is the control of water hyacinth. This plant is definitely strangling the economics of Louisiana's wildlife resources, recreational resources, drainage programs and is definitely destroying high economic values in many industries involving water-borne activities, such industries, as for example, lumbering, oil exploration and oil production.

It can be justly stated that the Division of Fish and Game of the Louisiana Department of Wild Life and Fisheries has done more work on a broader scale, affecting more aspects of the economic damage wrought by water hyacinth than any other governmental or private agency in the United States.

The Division of Fish and Game of the Louisiana Department of Wild Life and Fisheries wishes to acknowledge the unfailing assistance given to its water hyacinth program by three scientists: Dr. Clair A. Brown, Associate Professor of Botany, Louisiana State University, Baton Rouge, Louisiana; Dr. Frederich W. zurBurg, Professor of Chemical Engineering, Southwestern Institute, Lafayette, Louisiana, and Dr. William T. Penfound, formerly Head of the Department of Botany, the Tulane University, New Orleans, Louisiana. Dr. Penfound, with the great regret of all who have profited by his knowledge, aid and work in Louisiana studies, has become a member of the faculty of the University of Oklahoma at Norman, Oklahoma.

These three gentlemen have, throughout their association with the departmental program, provided invaluable aid.

The following report to which this statement is merely a preliminary introduction, gives in greater detail a description of the whole program together with a detailed account of the areas in which these experiments have been conducted, the amounts of the specific chemicals that have been applied and the manner in which they have been applied and the definite percentage of destruction accomplished by these applications, together with a very great deal of additional information concerning the procedures, the success and the subsequent history of areas treated for the destruction of water hyacinth:

DETAILED REPORT OF WATER HYACINTH PROGRAM

The water hyacinth annually costs an estimated damage of between sixty-five million and seventy-five million dollars in the State of Louisiana alone. The Department of Wild Life and Fisheries, and the former Department of Conservation, have energetically sought the answer to this serious problem. These activities will be briefly recorded below.

1. *Factual Data on Water Hyacinth.*

The water hyacinth (*Eichhornia crassipes*), often incorrectly known as a water-lily, is a perennial floating plant with lavender spike of flowers of orchid-like beauty. It is a tropical plant, belonging to the pickerel weed family (*Pontederiaceae*) and is a native to South and Central America. Due to its unique beauty it has been transplanted into many countries, including India, China, Japan, Philippines, Java, Australia, South Africa and the United States of America. In many parts of the world it has become a pest, and legislation has been enforced for its eradication. It was introduced to this country from Venezuela by Japanese representatives in 1884, during the International Cotton Exposition held in New Orleans. Since that time the water hyacinth has spread over the States of Louisiana, Mississippi, Florida, Southern Texas and Southern California. During recent years it appears to have become acclimatized to a somewhat colder climate, being already well established as far north as Savannah, Georgia, and the Arkansas and Louisiana border. At the same time it appears to have steadily spread southward into the brackish waters near the Gulf of Mexico, apparently adapting itself to higher salinity.

Another related species of water hyacinth (*Eichhornia paniculata*), a non-floating plant rooted in mud, was introduced into Southern Florida from Brazil probably at the same time but is not known to occur in Louisiana.

It has been observed during seasonal fluctuations of water levels that the water hyacinth (*Eichhornia crassipes*) is capable of taking root on moist land, and of producing flowers and ripe fruits. This amphibious adaptation makes it difficult, therefore, to control. As shown below, lowering the water level facilitates the germination of water hyacinth seeds.

Usually the water hyacinth is found in still, or slow-moving, waters. If left uncontrolled, it doubles in number every two weeks. Providing there is enough space, one plant may produce more than 65,000 plants in one normal vegetative season of approximately eight months in Northern Louisiana. This alarming rate of growth can be doubled farther south, or even in the central part of Louisiana, if the weather is unusually warm. In the southern-most part of Louisiana the growth of the water hyacinth is almost uninterrupted throughout the year, but in the latitude of New Orleans it flowers from April until December. The average size of the plant is between eighteen and thirty-five inches; extremely large plants can be as high as forty-eight, or even fifty, inches, with underwater roots of twenty or more inches.

The floating plants, often as many as 900,000 per acre, form a dense mat over the surface of a lake or bayou, covering sometimes the entire body of water. This mat represents a floating berth for the invasion of many other aquatic, wetland, or even terrestrial plants, such as alligator weed (*Alternanthera philoxeroides*), primrose willow (*Jussiaea diffusa*), various loosestrifes (*Ludwigia spp.*) and many others, which eventually entirely ruin the value of a given body of water. Often the mat of water hyacinth becomes so compact that it can support a dense growth of cattail, or even small trees, such as willow or young cypress.

The principal method of reproduction of the water hyacinth is accomplished by the growth of offshoots from the tip of its rhizome. Usually more than one offshoot can originate from a single rhizome at the same time. Therefore, in a dense mat of water hyacinth many plants are connected under water, and often even a very strong wind is unable to break the mat apart.

The large plants in a dense mat, as a rule, do not produce many flowers, probably due to the low light intensity under their leaves. The number of flowers per inflorescence (cluster) depends on the size of the plant, and may vary from two to thirty-eight. Under favorable conditions one plant can produce from five to ten inflorescenses per season. The pollination of water hyacinth flowers may be performed by insects, or by means of self-pollination. Each flower remains open only one day, after which the inflorescence normally bends and the flowers become submerged under the surface of water. The ripe capsule bursts and gets detached from the spike and falls down discharging seeds on the bottom or on the floating mat. The capsule produces from fifty to ninety microscopic seeds which germinate on decaying vegetation, exposed shore lines, stumps, logs and on the hyacinth mat itself. The number of seeds per acre has been estimated to be approximately fifty million. There is no direct evidence at the present time that the seeds germinate under water.

It has not been the job of the Fish and Game Division of the Louisiana Department of Wild Life and Fisheries to carry on a so-called "purely scientific" investigation of the biology of the water hyacinth plant since such researches occupy long periods of time and require both highly specialized equipment and specialized personnel. The scientists of the Division completely realize the basic importance of such investigations but have, by necessity, been compelled to conduct a practical program the objective of which has been to provide practical procedures in controlling and eliminating water hyacinth.

As a matter of fact, when the scientific literature is investigated, it is found that little work on the basic biology of the water hyacinth has been done anywhere in the world. This is the more surprising in view of the extraordinary economic importance of this plant pest. As far as the published information is concerned, the chief studies on the life history (growth, seed production, seed germination, etc.) of the water hyacinth has been done in India by Parija, working in India. Certain conclusions of Parija are here summarized but it must be remembered that these are based upon observations conducted on the other side of the world and under completely different conditions. Whether or not these conclusions are applicable to water hyacinth in Louisiana, we do not know but they are here stated for the reason that they are one group of the few water hyacinth studies of this character available.

According to Professor P. Parija (Indian Journal Agriculture of Science, 1934) the seeds of water hyacinth require preliminary drying as a necessary condition for their germination. Mechanical injury of seeds, which breaks the strong outer coat, facilitates germination, which takes place in from two to ten days. Water hyacinth sets ripe seeds only in the autumn, i. e., from September to November. The seeds remain dormant for at least one season—from November to June—and retain their viability for several years; at least five. For their germination, the seeds require a copious supply of free water in the soil, and an adequate supply of oxygen. The crop of seedlings appears usually after a shower. The seedlings appear on the surface in about six weeks after the germination.

The rhizome of a healthy water hyacinth when cut shows a light pink spot in the upper part; in a dying plant this spot fades out and then turns very dark.

The water hyacinth is able to flourish within a definite range of pH value, namely, 6.0-8.0. Any change to either side of this optimum checks the growth but does not kill the plant completely. A mild frost does not affect water hyacinth seeds and kills only some of the rhizomes. Submergence of water hyacinth stimulates the growth of offshoots which break and come to the surface.

II. *Economic Effect of Water Hyacinth in Louisiana.*

In spite of the fact that an area in Louisiana, totaling nearly a quarter of a million acres, is infested with water hyacinth, no profitable means of utilizing this plant has been discovered.

The analyses of the water hyacinth plant show that the average moisture content is approximately 95%, the balance being crude fiber, cellulose, etc. The ash of the water hyacinth contains 60% of $KC1$.

Although it has been found that cattle will eat the green leaves of the hyacinth which grow along the banks and in shallow water, if nothing better is available, the chemical analyses reveal that as a source of food it has no nutritive value.

From an economic viewpoint the use of the water hyacinth in the manufacture of paper, rope, etc., would be prohibitive in this country, due to the processing involved. Apparently, it has no commercial value. Furthermore, it is responsible for great losses in Louisiana's natural resources. These losses are briefly summarized as follows:

1. By cutting the light penetrating the water, the dense growth of water hyacinth breaks the most important chain in the production of phytoplankton, which is the primary food for all other aquatic animals. Without light there is no photosynthesis, and without photosynthesis there is no plant life in the form of minute floating algae. The planktonic shrimp-like copepods and cladocerans (water fleas) which depend entirely on these algae, are cut off from their food supply and rapidly disappear from the hyacinth infested waters. All other forms of aquatic life, including the fishes, especially plankton feeding shad, various minnows and particularly the fry of all fishes, being without food, also die from starvation. Finally, all fish life, with the exception of such air breathing species as gar and bowfin, are no longer found in the lakes and bayous the surface of which is covered by the water hyacinth. These two undesirable predators often quickly eliminate the last survivors of game fish.

2. In order to fulfill its respiratory requirements, the water hyacinth plants remove dissolved-in-water oxygen. This, in combination with the absence of oxygen produced by phytoplankton, reduces this vital gas to such a degree that fishes, except gar and bowfin, cannot live under the hyacinth mat. Together with fishes (exceptions indicated above), the rest of the aquatic animals except snakes, turtles and frogs, are suffocated in such waters. The hyacinth mat interferes with the normal interchange of gases between the water surface and the atmosphere. It prevents the release of carbon dioxide and hydrogen sulphide, which are toxic to fish. The first one, if present in small quantities, does not harm fish but in large quantities it is fatal, acting as a narcotic. The second one is very poisonous to all aquatic animals. It results from putrefaction, and through the action of anaerobic bacteria in the absence of oxygen.

3. The water hyacinth smothers and completely destroys the spawning grounds of large mouth black bass as well as all other species of fresh water fish.

Louisiana's ponds, streams and lakes, which were formerly such excellent fishing waters, have suffered untold damage. Millions of dollars have been lost in fish alone. Besides, this, heavy losses have been suffered by various dealers supporting commercial fishing and sporting fishing. The loss in recreational activities cannot readily be estimated in dollars and cents.

4. The water hyacinth is the number one enemy of the waterfowl. It is valueless as a source of food, blocks out light and mechanically tears up all other aquatic plants upon which ducks and geese feed, transforming good hunting and feeding lakes and ponds into barren areas. There is no question that the water hyacinth is responsible to a great extent for poor hunting, not only in Louisiana, but also by changing wintering areas, affects hunting in many other parts of the United States and Canada. The alarming decrease in the number of ducks migrating along two principal flyways, the Mississippi and Atlantic, can be explained in part by poor winter feeding grounds in Louisiana and Florida. The inland waters of both of these states are heavily infested with water hyacinth and do not provide at the present time adequate food for the waterfowl. The situation along the Pacific flyway is more favorable.

5. The water hyacinth is rapidly causing the destruction of good lakes and bayous by transforming them into useless, mosquito-swarming swamps, preventing navigation and forcing commercial fishermen, lumbermen and oil companies to excessive expense in conducting their operations. The transpiration of water from a normal hyacinth mat is about four times that of evaporation from a free water surface and some shallow lakes are rapidly losing the water needed for rice fields and other purposes.

6. The water hyacinth, having no nutritional value as food for muskrats is depriving the most important Louisiana fur-bearer of other food and is slowly destroying the trapping industry in this State which produces more than half of the muskrats in the United States.

This progressive interference chiefly results from the changes water hyacinth growth causes in the drainage patterns of once productive muskrat marshes.

7. The water hyacinth has caused the depreciation of the land values in many sections of Louisiana. It has forced the abandonment of camps and of fishing and hunting lodges thus depriving many citizens of their livelihood and lowering the standard of living in general throughout the State.

8. The water hyacinth completely blocks many Louisiana bayous and streams and makes navigation on them impossible causing great interference and damage to a number of important industries such as oil, lumber, fishing and trapping.

9. Water hyacinth is destroying crab nursery grounds and blocking crab fishermen from their fishing areas.

10. Water hyacinth, by burrowing access to the producing areas, often completely prevents the harvesting of such "cash crops" as spanish moss, etc.

III. *Economic Effect of Water Hyacinth in the United States.*

As has been mentioned already, one of the first introductions of the water hyacinth into this country was in 1884 from Venezuela at the Cotton Centennial Exposition in New Orleans. Since that time, it has penetrated into every Gulf Coastal State and to all Atlantic Coastal States reaching as far north as Virginia. It occurs also in Tennessee, Arkansas, California and possibly in other inland states. It is steadily spreading north. The nap growth of this pest in the basin of Rockefeller Center in New York, where it is kept for decorative purposes, is the best evidence that water hyacinth can grow outdoors in summer as far north as 41 degrees of latitude and probably farther north.

To avoid unnecessary repetitions, it is enough to say that the damage caused by the water hyacinth in Mississippi and Florida can be well compared with that in Louisiana. Although, the damage caused by the hyacinth in the more centrally located states is not great yet, the total damage to the United States of America probably exceeds a quarter of a billion dollars. It will be much greater if the water hyacinth should infest all the southern half of the United States.

IV. *Water Hyacinth Control Program.*

The necessity to control the water hyacinth in the Southern States was realized as early as 1890, when the National Congress appropriated $5,000 to study this obnoxious plant in Louisiana and Florida. Since that time the money spent by our Federal Government has increased many times. Before World War II, the equipment for the control of water hyacinth in the southern half of Louisiana alone cost the Federal Government more than half a million dollars, excluding the cost of operations.

A great deal of effort has been spent during the last fifty years by the Corps of Engineers of the United States Army in endeavoring to keep the essential waterways clear for navigation. Their excellent work must not be underestimated, for they developed the essential mechanical equipment for clearing the navigable canals and bayous from the water hyacinth, but, unfortunately, their work was formerly restricted only to operations in the lower parts of the streams, which are important to navigation. The upper parts of the streams, which are actually the starting points of spreading hyacinth, were then practically untouched by them. Congress, by a resolution passed last year, directed the Corps of Engineers, U. S. Army to conduct an inquiry into the whole matter of the water hyacinth; its economic importance and its control. The U. S. Department of Agriculture, U. S. Public Health Service of the Department of the Treasury, and the Fish and Wildlife Service of the U. S. Department of the Interior cooperated in this survey.

The Department of Wild Life and Fisheries of the State of Louisiana has been conducting experimental work on water hyacinth control for more than eight years, and has kept in closest touch with the latest developments in research. A survey of all the published data, and a comprehensive program of study of the life history and ecological relations of the water hyacinth, as well as the actual eradication of this plant from Louisiana waters, is being undertaken. In 1947 Legislature appropriated the sum of $200,000 out of the funds of the Department of Wild Life and Fisheries for use in fighting the water hyacinth. A summary of last year's work with new herbicides, based on 2,4-D derivatives, is hereinafter set out. Major James Brown, Director of the Fish and Game Division, has charge of this work. It is no exaggeration to state that Louisiana's Department of Wild Life and Fisheries is rapidly becoming a world center of information regarding water hyacinth research and control, and the eradication of this economic menace.

Before describing the new methods of control and eradication of the water hyacinth, it is necessary to give a brief review of former methods, and the reasons for their abandonment. The methods of water hyacinth control fall into the following categories.

1. Mechanical removal.
2. Control by other physical methods (use of flame throwers).
3. Biological control.
4. Chemical control by using poisonous substances.
5. Chemical control by using plant hormonelike substances.

A brief summary of the above named methods is as follows:

1. *Mechanical Removal*

Although mechanical control is practical, and can completely eradicate the water hyacinth in small restricted areas, it is very costly and cannot be used in large scale operations. It is impossible to eradicate the water hyacinth everywhere in Louisiana by mechanical methods alone. The cost of removing plants by hand, $200.00 per acre, is prohibitive; removal of the water hyacinth by machines costs $80 per acre; crushing the hyacinth by machines costs $40 per acre. There is also always the fact that high percentages of the parts of the crushed plants may recover.

William E. Wunderlich of the Corps of Engineers, U. S. Army, invented very efficient machines which were used by them and also by the Louisiana Department of Wild Life and Fisheries, in the early period of the hyacinth program.

Before the discovery of the herbicides, based on 2,4-D derivatives, mechanical control of the water hyacinth was the only effective, practical method of keeping navigation channels open. Recently this method was abandoned by the Louisiana Department of Wild Life and Fisheries because more efficient and much cheaper means were developed.

2. *Burning of Hyacinth*

Experiments with the most modern type of flame-throwers, operated by expertly-trained U. S. Army personnel, proved that this method of control of the water hyacinth is of no value whatever.

3. *Biological Control*

Two kinds of insect larvae are found in the water hyacinth rhizome which may destroy individual plants. They are, however, comparatively rare and nothing is known about their culture. It is very doubtful, therefore, if they can be artificially bred in quantities required for the eradication of the water hyacinth. As far as is known, no effective insects, bacteria, fungi or any other biological agent, for the efficient, practical destruction of water hyacinth have yet been found.

4. *Chemical Control by Uisng Poisonous Substances*

Chemical control by means of sodium arsenite was used for a long while in the destruction of water hyacinth. Arsenical compounds, such as were employed by the federal government, are extremely dangerous poisons for man, domestic animals and aquatic life and were never, at any time, used by the Division of Fish and Game of the Louisiana Department of Wild Life and Fisheries. Following instances of the death of cattle, mules and other domestic animals and the fatal poisoning of the captain of one of the spray boats, the federal government completely abandoned the use of these hazardous substances.

5. *Chemical Control by Using Plant Hormone-like Substances.*

The recent discovery of the plant hormone-like substances, completely harmless to man, and to aquatic and terrestrial animals but fatal to certain plants, quickly revolutionized methods of water hyacinth control. The Louisiana Department of Wild Life and Fisheries was one of the pioneers in this new field of activity. Both Major James Brown, the Director of the Fish and Game Division, and James Nelson Gowanloch, Chief Biologist of the Department, are responsible for the beginning of an extensive program which, for the first time, gives definite hope for complete eradication of the water hyacinth and the rehabilitation of aquatic life in the State.

The new chemicals are derivatives of dichlorophenoxyacetic acid (2,4-D), which, in almost unbelievably small quantities, completely upset the growth activities of plants and cause their death. Only certain plants are affected by this chemical and the water hyacinth is one of them.

2,4-D is readily absorbed by the leaves of the water hyacinth, is carried to all parts of the plants, and kills the entire individual plant.

2,4-D chemicals are now developed by dozens of major companies and are available in dry (sodium salt of 2,4-D) or liquid (butyl ester of 2,4-D, isopropyl ester, etc.) form. They can be diluted in water and applied as a spray by power units or, in a dry form, as an airplane dust. Both methods were widely used by the Department of Wild Life and Fisheries in various parishes of Louisiana and in many localities a hundred per cent kill of water hyacinth was obtained. During hot weather, the effect of 2,4-D can be seen in a few hours after application and the death of the water hyacinth takes place in two or three days. Cold weather delays the effect of the chemical for a much longer period due to the slower living activities of the water hyacinth, but, nevertheless, in many instances a complete kill was obtained even during November.

Investigations conducted in more northern latitudes have shown that certain perennial plants, when sprayed with 2,4-D during cold weather and even when such plants were covered with snow, were found to be fatally affected by the chemicals when the weather warmed up and the plants became active again.

The program of hyacinth control was planned in such a way that work started in the northern parts of Louisiana

Lake Concordia before dusting or spraying.

and proceeded down the streams and down state as a logical procedure.

Broad considerations compel the planning of a general program of attack on water hyacinth beginning in the northern part of the state and proceeding southward. This is logical and is the result of considerations of stream direction, characteristics of water seeds and effects of seasonal or intermittent flooding. It is perfectly obvious that even if an area in lower Louisiana were completely cleared of water hyacinth, such an area could be suddenly and even fully reïnfested by a water overflow from more northern hyacinth-covered sections. This is merely a part of a very necessary part of the planned program to eliminate water hyacinth as much as possible at its source.

Conditions of infestation by water hyacinth, methods of application, the amounts and kind of chemicals used and results obtained in various treated lakes and bayous are described in the following discussion.

V. *Eradication of Water Hyacinth in Louisiana.*

1. *Lake Concordia* (Near Ferriday—Concordia Parish).

This deep, formerly good fishing lake, a part of the old Mississippi river channel, has an area of 1,280 acres. At least 700 acres of it were covered with a heavy growth of water hyacinth before dusting operations took place. The first airplane dusting began on November 6th and 8th, 1946, when 5,000 pounds of 2,4-D dust were discharged over an area of approximately 500 acres, with an average coverage of 10 pounds per acre. Although the weather conditions during these operations were not at all favorable, the kill of water hyacinth, estimated on February 5, 1947, was 75%. (This represents the percentage of water hyacinth plants present actually treated with chemicals). The second dusting was performed on May 4, 1947, when an additional 1,000 pounds of Thompson-Hayward 15% 2,4-D dust were used. The effect of this dusting, though well seen within a few days, was overshadowed by the following spraying by the power units placed on small barges. This spraying started on May 26, 1947, and continued until December 8th, 1947. During this period, 2,933 pounds of dry and 57 gallons of liquid chemicals were used.

The liquid compound was "Weed-No-More", 40% 2,4-D acid, one quart of which was diluted with 50 gallons of water. The dry chemicals were of two different kinds: (1) "Ded-Weed", Thompson-Hayward 70% 2,4-D sodium salt, and (2) Standard Agricultural Chemicals, Inc., 70% 2,4-D sodium salt. Both of them were approximately of the same strength and were used in concentration one and one-half pounds per 50 gallons of water.

One 50-gallon drum covered approximately ½ acre of the water hyacinth area in about 7½ minutes. As the time of mixing the chemicals was about equal to that of spraying, one power unit covered an average of two acres of hyacinth growth in one hour, using 200 gallons of the mixture. The work was performed from 7:30 A.M. to 4:00 P. M. under generally favorable conditions as no spraying was done during the rainy weather.

The great extension of shore line, inaccessibility to certain places and rapid, natural multiplication of water hyacinth and also a delay in obtaining better pumps and other equipment, were a serious handicap. But in spite of all difficulties the water hyacinth crews succeeded in reducing infested areas by 50% during June. During July and

August, only 25% of the former hyacinth area was left and at the end of November and the middle of December, practically no live hyacinths were seen along the shores.

However, in the northern part of the lake and in its northwest wooded corner, a considerable concentration of green water hyacinth was left because power units were unable to penetrate there. In order to exterminate the remains of water hyacinth in Lake Concordia it was necessary to use an airplane again. These operations were performed in two flights, on October 14, 1947 and on December 1, 1947, when another 2,400 lbs. and 500 lbs. of Thompson-Hayward 15% 2,4-D dust were used respectively. On December 30th, 1947 and in the middle of January, 1948, no live hyacinth were discovered in Lake Concordia. The kill was estimated as high as 100%. (This represents the percentage of water hyacinth plants present actually treated with chemicals). The appearance of some seedlings is expected next spring but they can be controlled and finally exterminated with much less effort and expense.

Summary on Lake Concordia.

The total infested area of approximately 700 acres was cleared from water hyacinth in eleven months. The amount of chemicals used was as follows:

8,000 lbs.	of Thompson-Hayward 15% 2,4-D acid airplane dust
2,933 lbs.	of dry Thompson-Hayward and Standard Agricultural Chemicals, Inc., 70% 2,4-D acid

57 gallons of 40% 2,4-D acid "Weed-No-More".

2. *Black Bayou Lake* (Near Monroe—Ouachita Parish).

Black Bayou Lake constitutes a chain of four lakes with a total area of 750 acres, surrounded by 900 additional swamps. Approximately three-fourths of this combined area was heavily infested with the water hyacinth. It provided excellent fishing and duck hunting ground before the infestation, about twelve years ago.

Cleaning up shores of Lake Concordia.

Eradication of water hyacinth in Black Bayou Lake started in the spring of 1947. The following amount of dust was discharged from the airplane:

Black Bayou Lake

May 2, 1947	1,800 lbs.
May 3, 1947	1,200 lbs.
May 4, 1947	3,000 lbs.
May 11, 1947	1,800 lbs.
May 16, 1947	1,200 lbs.
Total	9,000 lbs.

Thorough examination of Black Bayou Lake, made on June 2, 1947, revealed that a large amount of water hyacinth was killed by the dust. However, a new luxurious growth of water hyacinth was observed all over the lake. The plants were young, bearing flowers and were not higher than 14 inches. Apparently the treated areas did not receive enough chemicals. Unfortunately, further treatment of the lake by spraying was postponed until September 1, 1947, when the water hyacinth spread again over the lake and the growth was much denser and older than before. Suspension of the hyacinth campaign was made because of alleged damage to cotton fields in the vicinity of Monroe.

Immediately after the first spraying, the amount of hyacinth in Black Bayou Lake began to decrease. By October 1, 1947, the use of three spraying units equipped with new high pressure pumps, changed considerably the appearance of the lake. Dead hyacinth plants were sinking rapidly and disappearing from the surface. The local people were much pleased with the results obtained. However, there were still large areas of green water hyacinth to which the barges could reach only with great difficulty. In the beginning of December, 1947, about 80% of the water hyacinth in Black Bayou Lake was killed. (This represents the percentage of water hyacinth plants present actually treated with chemicals).

The chemicals used for spraying from the beginning of September to the beginning of December, 1947, were as follows:

"Ded-Weed" Thompson-Hayward 70% 2,4-D sodium salt	1,985 lbs.
Standard Agricultural Chemicals, Inc., 70% 2,4-D sodium salt	2,475 lbs.
Total	4,460 lbs.

The strength of solution was 1¾ pounds per 50 gallons of water. The kill of water hyacinth in treated areas was high as 100%. (This represents the percentage of water hyacinth plants present actually treated with chemicals).

3. *Bayou Bartholomew* (Near Monroe - Ouachita Parish).

Approximately fifteen years ago, before the infestation with water hyacinth, Bayou Bartholomew was one of the best fishing bodies of water in Louisiana. Shortly before the outbreak of the last war, the lower portion of that bayou (about ten miles long), became heavily infested with water hyacinth. In 1943, the Department started to remove this plant from the bayou by mechanical means, using two conveyors. This operation was stopped because of war shortage and labor. Since that time, a very dense mat of water hyacinth covered that part of Bayou Bartholomew, the area of which was estimated as large as 340 acres. The dusting of

Plane dusting Bayou Bartholomew.

Bayou Bartholomew by airplane started on May 7th and finished on May 16th, 1947.

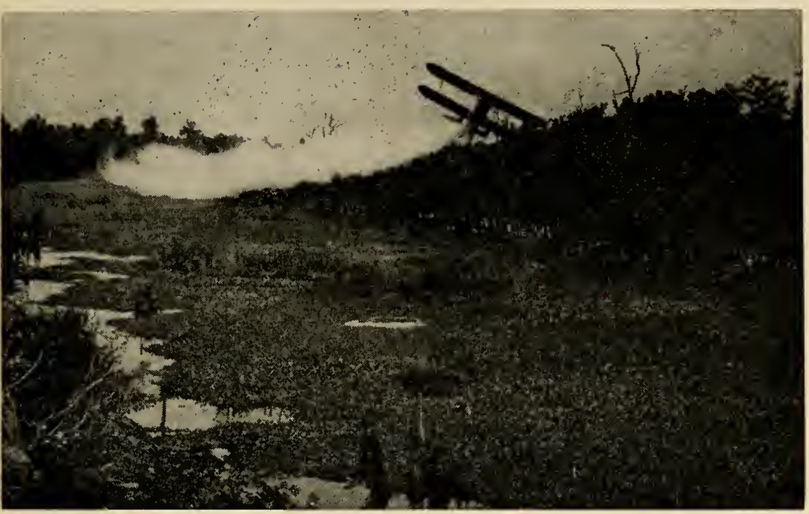
The amount and kinds of chemical used were as follows:

Bayou Bartholomew

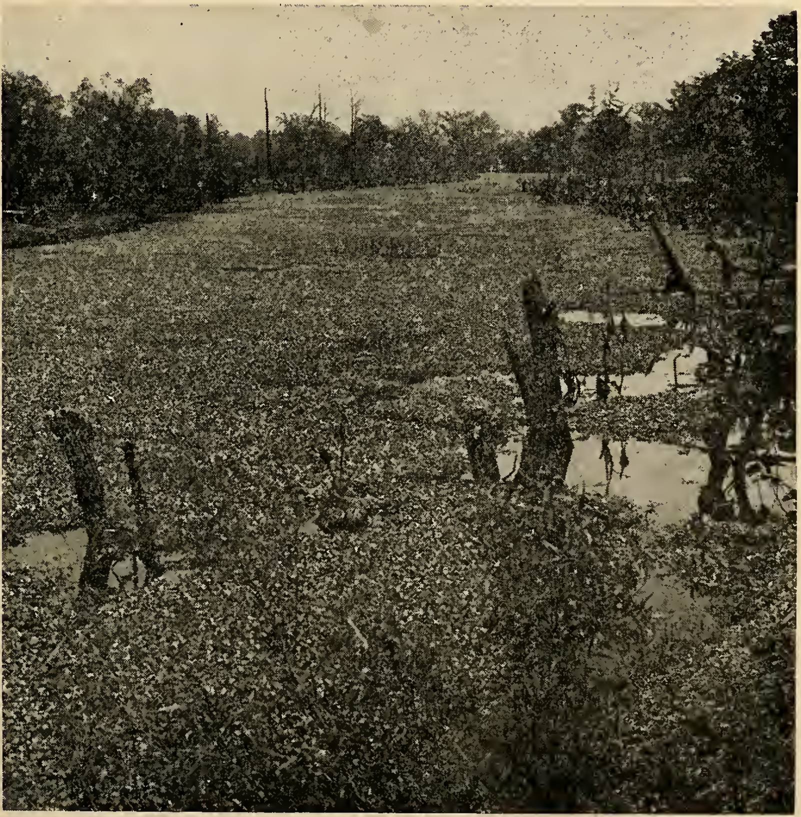
May 7, 1947	300 lbs.	Bartlett's 2,4-D, 15% acid
May 12, 1947	1,200 lbs.	Bartlett's 2,4-D, 15% acid
Total	1,500 lbs.	

Due to the exceptionally dry weather during May and June, 1947, the water level of the bayou dropped down about five feet and the germination of water hyacinth seeds took place.

In the beginning of July, 1947, about 99% of the surface of Bayou Bartholomew again was covered by a magnificent, flowering carpet of water hyacinth. The plants were young, from six to fifteen inches high and were rapidly multiplying. The concentration of the water hyacinth plants was between ten and twelve per square foot and the situation was critical.



Plane dusting Bayou Bartholomew.

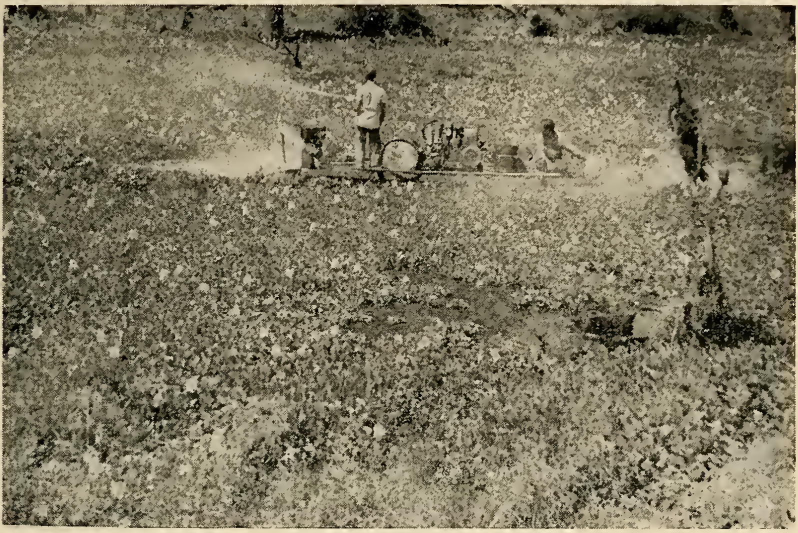


Bayou Bartholomew after dusting.

Spraying in Bayou Bartholomew.

The spraying of Bayou Bartholomew started as late as July 25, 1947, with the new pumps which produced good particles of spray and adequately covered the leaves of the water hyacinth. The drift of spray was not more than 20 or 25 feet from the point of spraying during the moderate wind so it was safe to spray without affecting cotton. The effect of 2,4-D spray on water hyacinth was noticed twenty-four hours after the first application but the work was developing slowly and with tremendous difficulties. Only about half of the bayou was sprayed before the end of August, 1947. Due to the conditions under which the men worked, it was almost impossible for them to cover all hyacinth growth evenly. In order to do better work, various cutting devices in front of the barges were tried but with little success. The chemical used was 70%, 2,4-D sodium salt of the Standard Agricultural Chemicals, Inc., and the strength of solution was 1¾ pounds per 50 gallons of water. This solution, used either alone or in combination with the "Ultrawet" gave a very good kill and in many parts of the bayou a hundred percent kill was obtained.

Ultrawet is one of a group of chemical substances known as detergents which have the effect of "making water wetter", in other words, water containing detergents, in-



Spraying in Bayou Bartholomew.

Hyacinths after spraying Bayou Bartholomew.

Hyacinth mats sinking, Bayou Bartholomew.

stead of forming drops on surfaces, spreads as a thin film over the surface. This remarkable action is naturally of high value in securing greater contact between the chemical solution and the plant cells. It is all the more remarkable because a very slight quantity of Ultrawet, namely, only four ounces, in 50 gallons of water, is necessary to accomplish this effect.

In the middle of September, 1947, the entire bayou was sprayed for the first time but the spraying was very uneven and many places were missed. The cutting saw-device in front of the barge has been replaced by a six-foot spearhead which was found to be more effective but even this improvement was insufficient to penetrate the thick mat of water hyacinth.

At the end of September, 1947, a complete coverage of Bayou Bartholomew was made for the second time.

On September 25, 1947, the careful examination of Bayou Bartholomew revealed that only 75% of the water

Bayou Bartholomew October 1947.

hyacinth were killed. (This represents the percentage of water hyacinth plants present actually treated with chemicals). The missed spots, with a total area of about 25% of the bayou, were still covered with green plants with flowers. At the same time, the dead hyacinth mats had begun to sink and the work was proceeding much faster. The barges were able to go through the decomposing plants with a greater speed and the spraying was more even.

In the middle of October, the kill of the water hyacinth was estimated as high as 85% and simultaneously about 25% of all dead mats disappeared from the surface.

The decomposition of the mats was going more rapidly in the month of November and the percentage of kill increased to 95%. (This represents the percentage of water hyacinth plants present actually treated with chemicals). The rains at the end of December, 1947, aided in sinking the mats and the percentage of kill reached 99%. (This represents the percentage of water hyacinth plants present actually treated with chemicals). Approximately half of the area of Bayou Bartholomew was free of water hyacinth mats at the end of the year: During the month of January, 1948, a new cutting device was applied which helped to break apart the disintegrating mats and sink them to the bottom.

On February 7th, about 75% of the bayou was entirely clear of water hyacinth and speed motor boats could be freely used in open water. The remains of dead hyacinth mats were disappearing fast and the percentage of kill at that time was estimated at 99.9% if not, 100%. (This represents the percentage of water hyacinth plants present actually treated with chemicals).

It must be stated that the eradication of water hyacinth in Bayou Bartholomew was the most difficult operation during the year of 1947.

The amount of chemicals used since the beginning of May to December 3, 1947, were as follows:

2,4-D 15% acid airplane dust	1,500 lbs.
2,4-D 70% sodium salt for spray	2,550 lbs.
Total	4,050 lbs.

4. *Chenie Lake* (Near Monroe—Ouachita Parish).

The area of this artificial lake is about twelve acres, one-quarter of which was covered by the water hyacinth. On September 3 and 4, 1947, all hyacinth was sprayed very carefully with the Sherwin-Williams "Magic Weed Killer" butyl ester of 2,4-D. The strength of solution was one pint of chemical per 15 gallons of water. The weather conditions were very favorable with air temperature of 95° F. Five days after spraying, the lake was thoroughly examined and all the rhizomes of water hyacinth were found dead. The kill estimated was as high as 100%. (This represents the percentage of water hyacinth plants present actually treated with chemicals). One month after spraying about half of the dead plants were decomposed and sunk.

On October 3, 1947 almost all dead hyacinth disappeared from the surface of the lake. In the beginning of

December, 1947, a dozen or so small seedlings were observed near the shore and were removed by hand and boat. On December 30, 1947, another seven seedlings were removed. The lake at that time was completely clear from water hyacinth. Only three seedlings were found at the end of January, 1948.

It is considered that a very successful experiment with butyl ester of 2,4-D has been accomplished in Chenie Lake. The amount of chemical used was only six gallons which entirely killed four acres of large growth of water hyacinth in less than one week's time. No doubt many seeds on the shore and logs were also affected because the number of seedlings was negligible. These seedlings can be exterminated without any difficulties in that lake.

5. *Swamp* (Near Winnsboro—Franklin Parish).

This small swamp ditch on the highway between Monroe and Ferriday, with an area of approximately one and one-half acre, almost completely covered with water hyacinth, was used for experiment with butyl ester of 2,4-D.

Four gallons of Sherwin-Williams "Magic Weed Killer" (Weed-No-More 40), diluted with 400 gallons of water, was used for this purpose. The spraying operation was performed on September 5, 1947 during the hot, bright weather. One month later, the kill was estimated as high as 99%. (This represents the percentage of water hyacinth plants present actually treated with chemicals). One small spot was missed where the water hyacinth was covered by other vegetation. This missed spot was dusted by hand in the middle of September, 1947, after which no live water hyacinth was observed during several visits in October and November, 1947.

The final kill was estimated to be 100%. (This represents the percentage of water hyacinth plants present actually treated with chemicals).

6. *Two Swamp Ditches Between Gilbert and Columbia* (Caldwell and Franklin Parishes).

These two swamp ditches, one with an area of two acres and another about twice as large, were used for the experiments with butyl ester of 2,4-D. The smaller ditch was completely covered with small floating water hyacinth plants. The larger ditch had both floating and rooted-to-the-ground water hyacinth. Both ditches were sprayed with Sherwin-Williams "Magic Weed Killer", (Weed-no-More 40), butyl ester of 2,4-D on September 6, 1947. The chemical was mixed with water in proportion of one gallon per 100 gallons of water.

One-half of a gallon of butyl ester was sufficient enough to kill all the floating water hyacinth in a smaller ditch in a few days. No regrowth at all appeared in that ditch. About a dozen of small seedlings collected in that ditch in November and December, 1947 show that not all seeds were killed by butyl ester of 2,4-D. This, of course, was not expected because some seeds are covered by mud.

In the larger ditch, where three and a half gallons of butyl ester were used, all floating plants were killed but plants rooted-to-the-ground showed the kill of only 90%. (This represents the percentage of water hyacinth plants present actually treated with chemicals). They showed a considerable regrowth during the months of October and November, 1947. During the month of December, 1947, the rooted hyacinth in the larger ditch began to die and by the end of that month almost all plants were dead. It is quite possible that the regrowth of water hyacinth, sprayed in September, 1947, was too weak to survive during the colder weather, later in the fall. It must be pointed out that the water hyacinth in many similar ditches elsewhere which have not been treated with 2,4-D were still alive during that period of time.

The experiment in these two ditches proved that the rooted plants require somewhat heavier application of 2,4-D than the floating ones.

7. *Saw Mill Pond at Urania* (La Salle Parish).

This pond, of about four and a half acres, was almost completely covered with old water hyacinth plants. It was sprayed on September 8, 1947, with 1% solution of Sherwin-Williams "Magic Weed Killer", butyl ester. The total amount of concentrated chemical used was five gallons.

Sixteen days later the pond was carefully examined and, with the exception of one small spot, the kill was estimated at 100%. (This represents the percentage of water hyacinth plants present actually treated with chemicals). This missed spot was in the center of the pond and the water hyacinth there was well protected from the spray by other plants. This missed spot was resprayed in the beginning of October, 1947, but on December 5, 1947, fifteen floating plants were found alive in the middle of this pond. They were removed within ten minutes and thrown high on the shore. During an examination on December 23, 1947, the pond was found clear of water hyacinth. No regrowth or seedlings were discovered. The plants thrown on the shore, as well as those in water were completely decomposed.

The kill was estimated as high as 100%. (This represents the percentage of water hyacinth plants present actually treated with chemicals). It was evident that the application of butyl ester of 2,4-D in this pond gave perfect results with the exception of one missed place where the water hyacinth plants were eradicated later.

8. *Saw Mill Pond at Fisher* (Sabine Parish).

This pond belongs to the Louisiana Longleaf Lumber Company which already spent a considerable amount of money and time to clear this industrial body of water from hyacinth. Although the size of the pond is only about fourteen acres the attempts to get rid of water hyacinth were not successful. The area infested was approximately ten acres. A fairly thick concentration of medium and large sized water hyacinth was sprayed with 1% solution of the Sherwin-Williams butyl ester of 2,4-D from September 9th through September 12th, 1947. Only eight gallons of butyl ester were used at that pond. The air temperature during the spraying was 95° F., and the plants were in bloom. The younger hyacinth plants were killed in twenty-four hours and the larger ones died two or three days later after an application of the chemical. During the first examination on September 20th, ten inflorescences were seen in two places. Most likely these plants were missed by the spray or the dying plants retained enough strength to later produce flowers. Such instances have been observed elsewhere.

Saline Lake after dusting by plane with 2,4-D.

All the flowering plants were exterminated at once. The pond at Fisher was visited again in October, November and December, 1947. No live water hyacinth or seedlings were observed during these examinations. The dead plants were already decomposed and had sunk to the bottom.

The kill was estimated to be 100%. (This represents the percentage of water hyacinth plants present actually treated with chemicals.)

9. *Saline Lake* (Natchitoches Parish).

This magnificent cypress lake, with an area of approximately 3,000 acres, was for a long time a famous place for many Louisiana and other sportsmen. Shortly before the last war, the water hyacinth found its way into Saline Lake and in the spring of 1946, at least 1,000 acres of the best fishing water were covered by the dense growth of the pest. The lake was almost ruined before the experiments with 2,4-D herbicides started there in June, 1946.

The work started on a small scale, more or less like an experiment, with one small power unit. Various chemicals such as: 2,4-D Dow Weed Killer, duPont's 2,4-D Weed Killer, Chipman's 2,4-D Weed Killer, Baker's 2,4-Dichlorophenoxyacetic acid, etc., were tried. In spite of many diffi-

Hyacinths in Saline Lake sprayed with 2,4-D by power sprayers.

culties involved and the lack of adequate equipment, the spraying was continued successfully until the 10th of December, 1946, and gave an amazing result. At least 95% of dense growth of large water hyacinth plants were killed and sunk. (This represents the percentage of water hyacinth plants present actually treated with chemicals). During this operation, the first time in the history of airplane dusting for water hyacinth on such a scale in Louisiana was done, the date of which was September 28th, 1946, when 500 pounds of Bartlett's 2,4-D 15% acid dust was discharged by the Natchitoches pilot, Joe Saleman, over fifty acres of water hyacinth in Saline Lake. The result of this experiment was 100% kill. (This represents the percentage of water hyacinth plants present actually treated with chemicals). The remains of the water hyacinth which were missed by spray were picked up by hand and boat during the second half of the winter, 1946-47.

In the spring of 1947, Saline Lake was practically free from water hyacinth. Only small patches of the former dead hyacinth mat were seen in a few places. At the end of June, 1947, a few seedlings were noticed on these patches which were easily exterminated. However, due to the extremely dry weather or for some other reason, the level of

Results of spraying of Saline Lake.

Saline Lake dropped down about eighteen inches during the middle of the summer and the shallow parts along the shore became exposed to the air. The seeds of water hyacinth started to germinate in wet mud and in the middle of August a great number of small seedlings appeared along the shores of Saline Lake. In one place, on the eastern shore of the lake, about twenty seedlings were counted per one square foot. At the same time, some seedlings appeared also on the exposed knees and stumps of cypress trees far from shore. It was necessary to exterminate them.

Two men were sent to Saline Lake in the second part of August with one small power unit and hand dusters. As the seedlings and young water hyacinth plants are very sensitive to 2,4-D chemicals, it was a comparatively easy task to kill almost all of them. Only about 400 pounds of dry 70% sodium salt of 2,4-D was necessary for that purpose. The final kill of the water hyacinth in Saline Lake, as estimated late in the fall of 1947, was 99.9%. (This represents the percentage of water hyacinth plants present actually treated with chemicals).

10. *Flag Lake* (In the Barksdale Field Reservation—Bossier Parish).

This lake is situated in the vicinity of Shreveport and represents a shallow body of water with an area of approximately 250 acres. The surface of the lake was almost covered by the aquatic plants mostly American lotus, white water lilies and water hyacinth. The latter species occupied at least one-fifth of the lake's surface.

As early as 1943, the Department of Wild Life and Fisheries took steps to clear Flag Lake of the water hyacinth by means of small, portable conveyors, but the work was stopped during the war. Since that time, the water hyacinth increased in number. Due to the shallowness of the lake and a great mass of floating and submerged vegetation, it was very difficult to spray the water hyacinth from boats. Therefore, a much efficient and quicker means was used, namely, dusting from the airplane. This was accomplished as follows:

1,750 lbs. of Thompson-Hayward 15%, 2,4-D (Ded-Weed #15) was discharged in the evening of September 23, 1947, and

850 lbs. of the same chemical was discharged early in the morning of the following day.

This total amount of 2,600 lbs. of dust was distributed under ideal weather conditions all over the lake covering the water hyacinth and American lotus as well. Assuming that the dust was equally distributed, this would average approximately ten pounds per acre. The examination of lotus and hyacinth leaves under the microscope revealed that an average of about 200 particles of fine dust fell on one square inch area.

Flag Lake was examined on December 6, 1947, i.e., about ten weeks after the dusting. It was found that the American lotus was strongly affected by 2,4-D dust. The white lilies also showed a good kill but the kill of water hyacinth was much lower than expected. It has been calculated that not more than 75% of it was killed in spite of the fact that weather conditions were favorable and the dust distributed satisfactorily. About 15% of regrowth and quite a few seedlings were found in the lake on December 6th. There was nothing unusual about the appearance of the seedlings because the level of the lake was about eighteen inches lower during the period of two months.

The comparatively low kill of water hyacinth in Flag Lake may be explained by the fact that in shallow water many hyacinth plants were rooted to the bottom. As has been observed elsewhere, the rooted hyacinth is far more resistant to 2,4-D than the floating ones. Apparently, ten pounds of dust per acre was not enough to kill the rooted plants.

However, as in many other localities, the regrowth of water hyacinth in Flag Lake apparently is not strong enough to withstand the winter. On January 24th, 1948, the kill of water hyacinth increased to 95%. (This represents the percentage of water hyacinth plants present actually treated with chemicals.) Further work was done during the winter to remove the remains of water hyacinth from Flag Lake.

11. *Moon Lake* (Near Taylortown—Bossier Parish).

This attractive clear lake, with an area of approximately 120 acres, is a part of the old Red River channel. Moon Lake is situated not far from Shreveport but is also often visited by fishermen from Alexandria. The water hyacinth started to grow in Moon Lake only a few years ago and fortunately was not numerous although the small patches of the pest were already scattered all along the shore. In the latter part of September, 1947, all the hyacinth was sprayed by one power unit. The spraying was accomplished in two days. Moon Lake was thoroughly examined by boat on December 7th, 1947. The kill, based on an examination of rhizomes, was estimated to be at least 95%. (This represents the percentage of water hyacinth plants present actually treated with chemicals). The old patches of hyacinth were killed and already decomposing. Very few live hyacinth plants were found in Moon Lake during that examination and they were in a very bad condition. There is little doubt that the majority of them will die during the winter because the effect of 2,4-D is always greatly delayed by cold weather. If any live plants or seedlings are seen in Moon Lake next spring, it would be much simpler and cheaper to pick those individual plants by boat.

12. *Chico Bayou* (Near Shreveport—Caddo Parish).

Chico Bayou is located about fourteen miles from Shreveport and is approximately two miles long and one hundred feet wide. The greater part of this bayou was covered very thickly with large, old water hyacinth. The average size of the plants measured forty-one inches above the water and the roots attained a depth of twenty inches. The concentration of water hyacinth was so dense that it was impossible to penetrate the entire growth by boat. The spraying operations in Chico Bayou began on September 18, 1947, and two miles of the bayou, partly covered with water hyacinth, was completed in six days. The chemical used was the Sherwin-Williams "Magic Weed Killer" butyl ester of 2,4-D, one gallon of which, diluted with one hundred gallons of water, covered approximately one acre. The area was extremely difficult to spray and many places could be reached only by wading into the bayou and using a long rubber hose. It was almost impossible to cover all the difficult areas with an even spray. In spite of all difficulties, the effect of butyl ester of 2,4-D was strongly pronounced after the first forty-eight hours.

Chico Bayou was visited and carefully examined on December 7th, i.e., about ten weeks after application of the chemical. The kill of old hyacinth, estimated on the basis of examination of several hundred rhizomes, was 93%. (This represents the percentage of water hyacinth plants present actually treated with chemicals.) It must be admitted that the spraying of this bayou was very difficult and the many old hyacinth plants were rooted to the bottom. Therefore, the percentage of kill obtained should not be considered poor at all.

Although the dead hyacinth was in a state of decomposition, at the same time a few seedlings, one or two inches high, were observed along the shores of the bayou. The concentration of seedlings was approximately one seedling per twenty feet of shore line.

A second application of 2,4-D, as well as picking some of the seedlings by hand, should be done at Chico Bayou next spring.

13. *Cox Pond* (Near Benton—Bossier Parish).

This artificial pond, with an area of about one and a half acres, was heavily infested with water hyacinth. The spraying of this pond was performed from the truck on October 1st, 1947. One percent solution of Sherwin-Williams butyl ester of 2,4-D was used for the treatment of the water hyacinth in that pond.

More than two hundred rhizomes were examined on December 6th, i.e., about two months after one application of 2,4-D spray and the percentage of kill was estimated to be as follows:

Floating hyacinth—100% kill. (This represents the percentage of water hyacinth plants actually treated with chemicals.)

Rooted hyacinth— 98% kill. (This represents the percentage of water hyacinth plants actually treated with chemicals.)

The few plants which still showed a pink spot in the rhizome were strongly affected and it is doubtful whether they will survive the winter.

14. *Two Large Ditches* (Between Benton and Plain Dealing—Bossier Parish).

Two large ditches on both sides of Highway #10, twelve miles from Benton, covering the area of approximately seven acres, were heavily infested with water hyacinth. They have been sprayed with the same chemical as the previous place.

Two months after spraying, the kill was estimated to be 80%. (This represents the percentage of water hyacinth plants present actually treated with chemicals). A considerable amount of regrowth had taken place. It is possible that some old, well rooted hyacinth did not receive enough chemical.

15. *Miller's Lake* (Near Ville Platte—Evangeline Parish).

Miller's Lake is an artificially created body of water with an area of approximately 2,300 acres. The water of Miller's Lake is used to irrigate the nearby rice fields and at the same time the lake provides an excellent fishing and duck hunting grounds for many sportsmen. The lake is comparatively shallow with an abundant aquatic vegetation and is very productive from a fisheries standpoint. To the scientist, and particularly to the wild life conservationist, the problems at Miller's Lake present a tremendous challenge. There is a definite danger that within the next few years Miller's Lake would be choked completely by the submergent and floating vegetation particularly by the water hyacinth. This lake first became infested with water hyacinth in 1941 and since that time it has spread rapidly.

The aerial surveys of the lake proved that there are three main concentrations of water hyacinth with the combined area of about 180 acres. As some of these concentrations were difficult to approach by boat, it was decided to dust the water hyacinth from the airplane. Such dusting operations were accomplished on three mornings during which the following amounts of Thompson-Hayward 15% 2,4-D acid dust were used:

June 18, 1947—4:30 A. M.-7:00 A. M.	4,000 lbs.
June 19, 1947—5:30 A. M.-8:00 A. M.	5,500 lbs.
June 25, 1947—4:30 A. M.-6:45 A. M.	2,000 lbs.
Total	11,500 lbs.

On June 18th and 19th, the operations were suspended early due to wind which reached the velocity from seven to ten miles per hour. The dust was distributed with remarkable uniformity covering the water hyacinth and American lotus. In the average, each square inch of exposed area received more than one hundred particles of fine dust. The leaves of water hyacinth were well covered with dew and the weather during the dusting was favorable. Unfortunately, on one occasion, namely on June 19th, two hours after the dusting of the central and largest concentration of water hyacinth, there was a heavy rain which lasted for four hours. The examination of that place, three weeks later, revealed that the kill of water hyacinth in the central portion of the lake was only 30%. (This represents the percentage of water hyacinth plants present actually treated with chemicals). It was uncertain if such a low kill was due to rain. The kill of another concentration, along the western shore of the lake, which was dusted the previous day, was 99%. (This represents the percentage of water hyacinth plants present actually treated with chemicals). In many places a one hundred per cent kill was attained. (This represents the percentage of water hyacinth plants present actually treated with chemicals). The regular examinations of hyacinth situation in Miller's Lake revealed that during the rest of the summer and early fall, about 15% of regrowth of water hyacinth appeared along the western shore of the lake. The lake was drained temporarily in the beginning of October, 1947. In the middle of the winter of 1947-48, a few men were sent to Miller's Lake to pick up the regrowth of water hyacinth there.

16. *Old River Area* (In Mansura-Marksville District—Avoyelles Parish).

The area concerned is a part of the old Mississippi River channel system and is located in Avoyelles Parish east of Marksville-Mansura line. It comprises the Old River proper, several of its tributary bayous and many lakes and swamps. The Old River, as well as its tributaries, only a few years ago were excellent fishing waters about nine miles long and from 200 to 300 yards wide. In the summer of 1947, at least 90% of it was covered with a dense mat of full grown water hyacinth. The average size of water hyacinth was twenty-four inches, with a concentration in places of as many as one hundred plants per one square yard.

The swamp, south of the Old River, has an approximate area of five and one-half square miles and contains one large lake called Central Slough and several smaller sloughs. The Central Slough is a natural fish hatchery for large mouth black bass and an important place for fishing with an area of at least 250 acres.

Slightly more than half of the total swamp area, south of Old River, was covered with water hyacinth a great deal of which was under the trees. The swamp, north of Old River, with about ten fairly size lakes (Grand Lake, Lac Siene, Coulee Noir, etc.) was only partly infested with water hyacinth. Only Petite Bay and Dick's Bayou and an adjacent swamp of about three-quarters of a square mile, were thickly covered with the pest. It has been estimated that the Old River area contained between four and one-half square miles of water hyacinth growth. It was decided to dust this vast area from the air because the growth was so densely scattered throughout the swamps and it was impossible to eradicate the hyacinth by spray from boat. A preliminary survey of the region has been done from the air and all water hyacinth concentrations were located as accurately as possible before dusting.

The dusting operation of this tremendous area started on October 14th, and was completed on November 25, 1947. With the exception of two or three fifty pound bags of Bartlett's 15% 2,4-D acid, all the dust used was the Thompson-Hayward 15% 2,4-D acid.

The amount of dust used in Old River area was as follows:

October 14, 1947	4,550 lbs.
October 15, 1947	2,100 lbs.
October 16, 1947	5,700 lbs.
October 17, 1947	950 lbs.
October 18, 1947	7,000 lbs.
October 19, 1947	3,500 lbs.
October 20, 1947	4,500 lbs.
October 21, 1947	2,500 lbs.
October 22, 1947	3,000 lbs.
November 6, 1947	800 lbs.
November 25, 1947	2,200 lbs.
Total	36,800 lbs.

Usually dusting was performed early in the morning often before sunrise and continued as long as the hyacinth leaves were covered by dew. No dusting at all has been done during rainy or windy days. At two places, namely, at the lower end of Old River, near the Spillway and near the bridge, two miles from Marksville, the dusting was repeated because the effect of 2,4-D there was less pronounced than in other parts of dusted area.

In general, dust settled very well and even under the heavy canopy of trees, not less than 500 particles of fine dust were counted on one square inch. In the open places, the number of particles was between 1,000 and 3,000.

The average amount of dust used per one acre of hyacinth area in Old River was between eleven and twelve pounds. The careful examination of more than 5,000 plants from different parts of dusted areas in Old River revealed that the effect of 2,4-D was greatly delayed by low temperature. It has been estimated that it takes from two to ten times longer to kill the water hyacinth during the fall of the year than during the summer. However, it has been proven by the experiments in Old River that complete kill of water hyacinth is possible even during the month of November.

The results of the observations made in ten different stations in Old River area may be summarized as follows:

(1) The bending and distortion of the plants (scientifically termed epinasty) in water hyacinth at temperatures lower than 51° F., occurs in about one week after the application of 2,4-D dust.

(2) Younger plants begin to die approximately ten or twelve days after dusting.

(3) Old plants, and especially the rooted to the ground ones, may remain still alive three weeks after dusting.

(4) The average percentages of kill were as follows: 30% in one week; 45% in two weeks; 60% in three weeks; 75% in four weeks; 90% in five weeks; 92% in six weeks; 95% in seven weeks and 99% to 100% in eight weeks after the time of application of 2,4-D dust. (This represents the percentage of water hyacinth plants present actuallly treated with chemicals.)

(5) Many plants showed a temporary regrowth before they finally died. Apparently the regrowth in treated plants was too weak to survive.

(6) The seasonal change of color in water hyacinth, superficially similar to the effect of 2,4-D does not kill the plant and furthermore both appearances can be easily and accurately distinguished.

(7) The total percentage of kill of water hyacinth in Old River area, after the airplane dusting from the middle of October to the end of November, 1947, was finally estimated as high as 99%. (This represents the percentage of water hyacinth plants present actually treated wtih chemicals.) A few plants which were found still alive during the month of January, 1948, were in such condition that it is doubtful they could survive.

(8) The dusting of Old River area gave amazingly good results in spite of the late operation.

(9) It is expected that some seeds of water hyacinth will germinate in the area next spring and it is strongly recommended to keep at least two teams with spraying and hand-dusting outfits to keep the seedlings under control.

(10) Although it has apparently been established experimentally that seeds of at least some plants do not readily germinate in soil treated with 2,4-D, it has been established by other experiments that the toxic effect of the 2,4-D chemicals in moist soils lasts only from about three to six weeks. This is an extremely important matter since the soil is not thus sterilized and future planting can be quickly carried out. Certain other chemicals used in weed killing (such as for example, ammonium sulphamate) do actually sterilize the soil for periods of as much as many months.

17. *Johnson Lake* (Near Moncla—Avoyelles Parish).

This lake is situated inside of the bend of Red River, one mile east of Moncla and indicated on the map under the name of Ben Routh Lake. Formerly, it was an excellent fishing lake. The total infested area of this lake, together with the adjacent swamps covered with water hyacinth, is about three-fourths of a square mile.

Johnson Lake has been dusted twice: the first time on October 25th and the second time on November 29th, 1947. The amount of dust used during these two days was 5,350 pounds and 2,000 pounds, respectively, which make a total of 7,350 pounds. Estimating the infested area to be approximately 480 acres, the average amount of chemical distributed over the hyacinth was at least 15.3 pounds per acre. The dust used was Thompson-Hayward 15%, 2,4-D acid.

The reason for the second dusting was that on November 27th, after a careful examination of more than two hundred rhizomes of rooted water hyacinth, the percentage of kill was found to be only 60%. (This represents the percentage of water hyacinth plants present actually treated with chemicals.)

The kill of floating plants was estimated at the same time to be as high as 99%. (This represents the percentage of water hyacinth plants present actually treated with chemicals.)

The second dusting operation was performed in the evening on November 29th, under ideal dusting conditions. The weather was calm and a heavy dew fell two hours later. The dust settled well on the hyacinth leaves. The average number of visible particles was about 3,000 on one square inch.

The result of the last dusting operation was checked on December 21st, i.e., three weeks later and an examination of two hundred rhizomes revealed that at least ninety-five per cent of the rooted hyacinth was strongly affected by the 2,4-D acid. (This represents the percentage of water hyacinth plants present actually treated with chemicals.) During the examination the level of the lake was about eighteen inches higher than at the time of dusting and many formerly rooted hyacinths were detached from the bottom and found floating abnormally on the surface with dead or dying rhizomes. The rhizomes of hyacinth plants which were still attached to the bottom showed the same condition.

An examination of this lake (at the same station) was made again on January 5, 1948, when another 200 rhizomes were cut. None were found alive. In spite of the fact that the rhizomes of the plants were definitely dead, some of their leaves were still green. This shows that the effect of 2,4-D acid on the water hyacinth was greatly delayed by slow metabolism due to cold weather.

A routine examination of another 200 rhizomes at the same station, made on January 20, 1948, revealed a one hundred percent kill. (This represents the percentage of water hyacinth plants present actually treated with chemicals). No regrowth, or seedlings, were observed at that date. All green leaves of the floating water hyacinth had turned brown or greenish-black after the frost which occurred a few days before. The area of dead hyacinth mat had diminished to about one-half of its size since the last examination. No regrowth or seedlings were noticed among the rooted water hyacinth in Johnson Lake after the application of 15.3 pounds per acre of 15% 2,4-D acid dust.

18. *Richardson Lake* (Near Echo-Rapides Parish).

Richardson Lake composes slightly more than one-half square mile of cypress swamp in the middle of the bend of Red River, two miles north of Echo.

This formerly good fishing and hunting lake was almost completely covered with the water hyacinth in the summer of 1947. The average number of hyacinth plants was 104 per square yard.

The dusting of Richardson Lake was completed in one morning on October 26, 1947, when 5,200 pounds of Thompson-Hayward 15% 2,4-D dust were distributed from the air over approximately 360 acres of heavy growth of water hyacinth. This will give slightly more than fourteen pounds per acre. The dusting was perfect. The observation point was selected in the wooded swamp among the high cypress trees and the average number of dust particles settled on one square inch has been estimated at 1560. It was a dull, calm day and the air temperature during dusting was 62.6°F.

Two weeks after dusting, the lake was visited again and 250 water hyacinth plants were examined over a quarter of a mile stretch. All of them were found dead or dying.

A second check was made in the beginning of December, 1947, which revealed a 100% kill. (This represents the percentage of water hyacinth plants present actually treated with chemicals).

19. *Bayou near Echo* (Avoyelles Parish).

This bayou is about one mile long and from 20 to 50 feet wide. Before spraying, half of this bayou was covered with small and medium sized water hyacinth plants. Some plants were 30 inches high and many of them were rooted to the bottom. On December 2nd, when this bayou was examined for the first time, the effect of 2,4-D was already noticeable. One hundred and ten rhizomes, selected from different places, showed pink spots, an indication that they were still alive. Two weeks later, during the second examination, the pink spots had disappeared in forty-three per cent of the plants. (This represents the percentage of water hyacinth plants present actually treated with chemicals.) (One hundred rhizomes were cut.) On January 13th, 1948, another hundred plants examined showed a one hundred per cent kill. (This represents the percentage of water hyacinth plants present actually treated with chemicals). The leaves of some hyacinth were still green but the rhizomes were dead and soft. Neither seedlings nor regrowth have been noticed in this bayou up to the present time.

20. *Ditches between Marksville and Alexandria.*

There are five ditches on Highway No. 5 between Marksville and Alexandria which were sprayed from truck during the latter part of November, 1947. They are as follows:

(1) An open ditch on Highway No. 5, one-half mile from Echo on the way to Alexandria.

The area of third ditch is approximately one acre. Practically the entire ditch was covered with water hyacinth from eighteen to twenty-four inches high before it was sprayed. However, few hyacinth were rooted. Examinations were made on December 2nd and 16th, 1947, and January 13th, 1948. The total number of plants checked was three hundred and fifty. A complete kill of water hyacinth was achieved and when this ditch was last examined on January 13th, no regrowth had appeared.

(2) A ditch, three hundred feet long and thirty feet wide, six miles northwest of Echo on Highway No. 5.

This ditch was partly covered with small water hyacinth. An examination was made on December 2nd, 1947, i.e., about six days after spraying. It showed very little effect of 2,4-D acid. In the middle of December, one hundred rhizomes examined showed only a thirty-seven per cent kill. (This represents the percentage of water hyacinth plants present actually treated with chemicals.) On January 13th the percentage of kill was estimated as low as forty per cent. (This represents the percentage of water hyacinth plants present actually treated with chemicals.)

The water hyacinth in this ditch were rather small and nearly all were floating hyacinth. There is a possibility that the 2,4-D solution made by the men was too weak. Although this ditch is not an important body of water, the cause of such a low kill, if the spraying were done correctly, is of extreme significance. The kill of water hyacinth in this experimental ditch is the lowest we have had during the past year.

3. Small pond on the right side of Highway No. 5, nine and one-eighth miles from Echo enroute to Alexandria.

The area of this pond is between three and four acres. The hyacinth growth was seen only along the shores. When sprayed during the latter part of November, 1947, the water hyacinth were of medium size and partially rooted. Examinations were made on December 2nd and 16th, 1947, and January 13th, 1948. The final estimate of kill, made on January 13th, was one hundred per cent. (This represents the percentage of water hyacinth plants present actually treated with chemicals.) No regrowth has been found to date.

4. Large ditch about one mile long and ranging from twenty to sixty feet wide on Highway No. 5. (6.03 miles from Alexandria enroute to Lake Charles).

Half of the surface of this ditch was covered by small and medium sized hyacinth. Only a small number were rooted to the bottom. The kill of water hyacinth in this ditch was high. On December 2nd, the kill was estimated to be as high as ninety-five per cent, based upon an examination of one hundred rhizomes. On January 13, 1948, a second examination revealed approximately the same conditions. (This represents the percentage of water hyacinth plants present actually treated with chemicals). The leaves of the hyacinth were still green but the rhizomes were dead or showed definite signs of dying.

5. Small pool situated ten and one-half miles from Alexander on Highway No. 20 en route to Boyce.

The area of this pool is about three-quarters of an acre. The hyacinth growth was small and covered less than half of the pool's surface when sprayed the latter part of November, 1947. An examination was made on December 2, 1947, and the pool was found to be almost dry but a number of seedlings were observed in small pockets of water. The percentage of kill was estimated to be seventy-five percent, based upon an examination of one hundred rhizomes. (This represents the percentage of water hyacinth plants present actually treated with chemicals.) During the second examination of that ditch, at the end of January, 1948, no live hyacinth was discovered there and the kill was estimated to be one hundred percent. (This represents the percentage of water hyacinth plants present actually treated with chemicals.)

21. *Coco and Fish Bayou Lakes Area* (Near Hamburg—Avoyelles Parish).

This extensive and heavily infested water hyacinth area is enclosed within a bend of Bayou de Glaises and situated about one mile northeast of Hamburg. The area is mostly stagnant but Fish Bayou Lake itself has an outlet through Tilden Lake and Fish Bayou into Atchafalaya River. The heaviest infestation was discovered in the northern portion where four long lakes (named by us No. 1, No. 2, No. 3 and No. 4 lakes), covered from 90% to 95% with water hyacinth.

The largest and the most important, Coco Lake, with an area of approximately 150 acres, has only about 45% of open water. Formerly this lake was excellent for large mouth bass fishing and duck hunting.

Fish Bayou Lake had only about 400 square feet of water hyacinth in its northern end, apparently it has been infested with the hyacinth only recently. It was impossible to eradicate water hyacinth in this area by spraying it from boat because the growth was too dense and many plants were growing rooted in the swamps. It has been roughly estimated that hyacinth cover the total 1100 acres. Therefore, it was decided to dust the infested areas from the air.

A thorough aerial survey of all infested water hyacinth lakes and sloughs were made before the dusting and the operation was planned carefully.

The dusting of Coco and Fish Bayou lakes area started on October 28th, and was completed on December 1st, 1947. Fog, wind and heavy rain prevented dusting for several days. The amount of dust used during that time was as follows:

October 28, 1947	4,500 lbs.
October 29, 1947	4,500 lbs.
November 8, 1947	3,400 lbs.
November 13, 1947	500 lbs.
November 27, 1947	5,450 lbs.
November 28, 1947	1,000 lbs.
November 29, 1947	6,950 lbs.
November 30, 1947	2,500 lbs.
December 1, 1947	500 lbs.
Total	29,300 lbs.

Slightly more than twenty pounds of dust were used per acre. The average number of particles of dust on one square inch was estimated to be between 2,000 and 3,000. Such heavy dusting was necessary because of tremendous concentration of old rooted hyacinth in swamps and particularly seedlings, the number of which in certain places was as large as 200 in one square yard. It must be mentioned that on certain occasions during the dusting of Coco-Fish Bayou Lake area, the temperature during the nights and early mornings was below the freezing point but the days were warm. This condition did not prevent the absorption of 2,4-D by hyacinth leaves and the bending and distortion of the plants was as usual. The effects of chemical, of course, were greatly delayed by the cold weather but nevertheless the final examination of the area revealed the kill between 99% and 100%. (This represents the percentage of water hyacinth plants present actually treated with chemicals.)

22. *Two Lakes* (Near Choctaw Bayou — Avoyelles Parish).

These two unnamed lakes have an area of about ten acres each and are situated about a half mile from the Red River bank near the levee at the northern end of Choctaw Bayou. They have no connection with Choctaw Bayou or other bodies of water except Red River proper during periods of extreme high water. The area, infested with water hyacinth, was estimated to cover more than a half of each lake, or a total of about fifteen acres. The plants were in a healthy condition during the dusting operation on November 29, 1947, when 400 pounds of Thompson-Hayward dust was used. Such a heavy dusting was necessary because many of the water hyacinth were rooted to the ground and required more dust. The effect of the chemical was noticeable six days after dusting although all the rhizomes of the hyacinth were still alive. Five weeks after dusting, these lakes were thoroughly inspected and the percentage of kill, based on examination of two hundred rhizomes, was estimated to be as low as 46.6%. (This represents the percentage of water hyacinth plants present actually treated with chemicals.) At the same time a considerable amount of regrowth had taken place. Apparently, the effect of 2,4-D in these lakes was greatly delayed by low temperatures. However, eight weeks after dusting, the percentage of kill increased to 85% and the regrowth was dying rapidly. (This represents the percentage of water hyacinth plants present actually treated with chemicals.) Two weeks later, almost all water hyacinths in these two lakes were found dead or dying.

23. *Fullerton Mill Pond* (Vernon Parish).

The total area of this pond is twelve acres, half of which was covered by water hyacinth. On November 26th and 27th, 1946, the plants were sprayed with Sherwin-Williams "Weed-No-More #40", butyl ester of 2,4-D. The concentration of chemical used was one quart per fifty gallons of water and the amount used for that pond was only six quarts.

Although the leaves of the plants turned brown, seventeen days after spraying, the effect of chemical was delayed by cold weather. On February 28th, 1947, the kill was estimated to be slightly over 75%. (This represents the percentage of water hyacinth plants present actually treated with chemicals). In the spring of 1947, all the rest of water hyacinth died and thus total kill was attained.

24. *Clear (or Black) Lake*—"Smith's Camp" (Natchitoches Parish).

The nine acres of the area was completely covered with the water hyacinth. The plants were sprayed with Dow 2,4-D on July 20th, through the 23rd, 1946, during fair, warm weather (85°F.). The total amount of chemical used was only 15 pounds and the concentration was one-fourth pound per 100 gallons of water.

The plants began to turn brown within ten days after the application of 2,4-D and on September 23rd, 1946, the kill appeared to be 85%. (This represents the percentage of water hyacinth plants present actually treated with chemicals.) The second application of the same chemical was made on September 24th, 1946. At that time only four pounds of Dow's 2,4-D was used and the concentration was the same as during the previous spraying.

Twenty-one days after the second application, the plants were breaking apart and sinking. Sixty-two days after the second application, the kill was estimated to be 100%. (This represents the percentage of water hyacinth plants present actually treated with chemicals.)

25. *Lake Bistineau* (Bossier and Bienville Parishes). The total area of this lake is several square miles and is only infested by small patches of scattered water hyacinth. It was sprayed from October 1st to November 30th, 1946, with Baker's 2,4-D concentration, two pounds per one hundred gallons of water. The total amount of chemical used was 240 pounds. The weather was cool and clear (60°F.). This lake was re-examined on February 12th, 1947, and the kill was estimated at 95% at least. (This represents the percentage of water hyacinth plants present actually treated with chemicals.)

The spraying was repeated in April and May of 1947 when an additional 600 pounds of Thompson-Hayward 70% 2,4-D sodium salt was used. Total kill of water hyacinth in Lake Bistineau was achieved after that treatment. Occasional seedlings are watched for and picked up by the local enforcement agent.

The following summary gives in tabular form the location of the reported water hyacinth operations together with a statement of the percentage of kill observed among the plants treated with the various 2,4-D compounds in various ways as observed at the time this report was concluded or where operations terminated earlier as observed at the end of each operation.

It must again be emphasized that these percentages of kill cover only water hyacinth plants present which were treated with the chemicals elsewhere indicated. It must be further emphasized that regrowth of water hyacinth can occur from seeds which may have escaped chemical contact either through buried in mud or for other reasons. Therefore, when the reader notes in earlier sections of this report that a one hundred percent kill is shown, and yet in the same treated area seedlings is subsequently reported, the figure of 100% still stands as representing the complete kill of water hyacinth plants (not seeds) present and treated.

Body of Water	*Parish*	*Percentage of Kill*
Bayou Bartholomew	Ouachita	99.9%
Black Bayou Lake	Ouachita	100%
Chenie Lake	Ouachita	100%
Lake Concordia	Concordia	100%
Winsboro Ditch	Franklin	100%
Columbia Ditches	Caldwell and Franklin	99%
Urania Sawmill Pond	LaSalle	100%
Fisher Sawmill Pond	Sabine	100%
Saline Lake	Natchitoches	99.9%
Flag Lake	Bossier	95%
Moon Lake	Bossier	95%
Chico Bayou	Caddo	93%
Cox Pond	Bossier	99.9%
Barrow Pits near Benton	Bossier	80%
Miller's Lake	Evangeline	90%
Old River Area	Avoyelles	99%
Central Slough	Avoyelles	100%
Johnson Lake	Avoyelles	100%
Richardson Lake	Rapides	100%
Coco Lake	Avoyelles	99%
Bayou near Echo	Avoyelles	100%
Ditch No. 2 near Echo	Ditches near Marksville and Alexandria Avoyelles and Rapides Parishes	99-100%
Ditch No. 3 near Blasdelle's Sta.		
Ditch No. 4 on Highway No. 5		
Ditch No. 5 near Alexandria		
Ditch No. 6 near Boyce	Rapides	100%
Ditch near Choctaw Bayou	Avoyelles	85%
Fullerton Mill Pond	Vernon	100%
Clear (or Black) Lake	Natchitoches	100%
Lake Bistineau	Bossier and Bienville	100%

HYACINTH CONTROL
REPORT OF EXPENDITURES
FISCAL YEAR 1946-47

Account No.		Actual 1946-47
101.00	Salaries	$12,709.33
103.00	Wages of Laborers	16.00
105.00	Professional Services	346.19
208.00	Heat, Light, Power, Water	8.83
210.00	Insurance	429.18
215.00	Freight, Drayage, Express	84.22
216.00	Printing, Reproducing	13.00
218.00	Rents, Use of Property	159.70
220.00	Repairing and Servicing Property	1,384.50
224.00	Technical and Mechanical Services	1,126.90
226.00	Telephone and Telegraph	.56
228.00	Traveling Expenses	5,375.97
266.00	Accounts Payable Setup	3,361.74
301.00	Building Supplies	53.66
302.00	Lumber	10.01
303.00	Paint and Supplies	21.25
304.00	Clothing Supplies	181.40
308.00	Educational and Recreational Supplies	5.74
322.00	General Plant Supplies	202.81
324.00	Hand Tools	67.86
326.00	Chemical	42,383.85
332.00	Laboratory and Medical Supplies	646.04
336.00	Motor Vehicle Supplies	1,305.13
342.00	Repair Supplies	98.28
366.00	Accounts Payable Setup	14,817.99
602.00	Automotive Equipment	6,377.81
616.00	General Plant Equipment	4,441.09
618.00	Farm Equipment	888.75
666.00	Accounts Payable Setup	2,167.19
	Total	$98,684.98

SUMMARY FISH DISTRIBUTION—1946

	L. M. Bass		Perch		Crappie		Striped Bass		Other		Total		Disposition	Parish
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
Barrow Pits (Tensas)														
Apr. 22, 1946..	17	12	......	......	329	78	.....	......	......	......	346	90	Lake Despair	Madison
Apr. 26, 1946..	7	7	......	......	223	49	.....	......	......	......	230	56	Lake Despair	Madison
Apr. 27, 1946..	14	13	......	......	261	60	.....	......	......	......	275	73	Edwards Lake	Jackson
May 1, 1946...	34	21	......	......	840	105	.....	......	......	......	874	126	Lake LaFourche	Richland
May 3, 1946...	22	33	......	......	490	90	.....	......	......	......	512	123	Lake Erwin	Richland
May 4, 1946...	29	24	......	......	520	101	.....	......	......	......	549	125	Lake Edwards	Jackson
May 6, 1946...	53	28	......	......	850	98	.....	......	......	......	903	126	Girl Scout Lake	Bienville
May 7, 1946...	47	27	......	......	850	98	.....	......	......	......	897	125	Girl Scout Lake	Bienville
May 9, 1946...	60	24	......	......	850	98	.....	......	......	......	910	122	Girl Scout Lake	Bienville
May 10, 1946..	51	29	......	......	850	98	.....	......	......	......	901	127	Girl Scout Lake	Bienville
May 16, 1946..	39	18	......	......	1,920	192	.....	......	......	......	1,959	210	Oak Ridge, La.	Morehouse
May 17, 1946..	17	6	......	......	960	112	.....	......	......	......	977	118	Oak Ridge, La.	Morehouse
May 21, 1946..	37	16	......	......	720	108	.....	......	......	......	757	124	Oak Ridge, La.	Morehouse
May 22, 1946..	33	19	......	......	678	105	.....	......	......	......	711	124	Clear Lake	Richland
May 23, 1946..	31	15	......	......	715	109	.....	......	......	......	746	124	Clear Lake	Richland
May 24, 1946..	34	16	......	......	700	110	.....	......	......	......	734	126	Edwards Lake	Jackson
May 27, 1946..	17	16	......	......	700	110	.....	......	......	......	717	126	Oak Ridge, La.	Morehouse
May 29, 1946..	8	7	......	......	600	105	.....	......	......	......	608	112	Oak Ridge, La.	Morehouse
May 29, 1946..	8	7	......	......	340	56	.....	......	......	......	348	63	Clear Lake	Richland
May 30, 1946..	3	1	......	......	350	56	.....	......	......	......	353	57	Edwards Lake	Jackson
(Rapides)														
July 8, 1946...	.....	......	......	......	900	120	3	½	......	......	903	120½	Hospital Lake	Rapides
July 9, 1946...	.....	......	......	......	550	70	.....	......	......	......	550	70	Kinkade Lake	Rapides
July 9, 1946...	.....	......	......	......	203	33	.....	......	......	......	203	33	Hospital Lake	Rapides
July 12, 1946..	.....	......	......	......	705	90	.....	......	......	......	705	90	Kinkade Lake	Rapides
July 16, 1946..	.....	......	......	......	650	74	.....	......	......	......	650	74	Kinkade Lake	Rapides
July 17, 1946..	.....	......	......	......	800	77	.....	......	......	......	800	77	Hudson Creek	
July 23, 1946..	.....	......	......	......	900	90	.....	......	......	......	900	90	Hudson Creek	
July 23, 1946..	.....	......	......	......	226	101	.....	......	......	......	226	101	Evangeline St. P.	Evangeline

SUMMARY FISH DISTRIBUTION—1946

	L. M. Bass		Perch		Crappie		Striped Bass		Other		Total		Disposition	Parish
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
Natchitoches Fed. Fish Hatchery														
May 22, 1946..	1,000	18¼	......	......	......	......	......	......	......	......	1,000	18¼	Sandy Creek	
May 22, 1946..	1,000	18¼	......	......	......	......	......	......	......	......	1,000	18¼	L. Kisatc'ie Bayou	
May 22, 1946..	1,000	18¼	......	......	......	......	......	......	......	......	1,000	18¼	Bayou L'lvronge	
May 22, 1946..	5,000	91½	......	......	......	......	......	......	......	......	5,000	91½	Kisatchie Bayou	
May 24, 1946..	2,000	11¼	......	......	......	......	......	......	......	......	2,000	11¼	Drakes Creek	
May 24, 1946..	1,600	9	......	......	......	......	......	......	......	......	1,600	9	Boggy Six Mile	
May 24, 1946..	2,000	11¼	......	......	......	......	......	......	......	......	2,000	11¼	W. Fork Six Mile	
May 24, 1946..	2,000	11¼	......	......	......	......	......	......	......	......	2,000	11¼	East Six Mile	
May 29, 1946..	2,000	20	......	......	......	......	......	......	......	......	2,000	20	Grays Creek	
May 29, 1946..	5,000	50	......	......	......	......	......	......	......	......	5,000	50	Big Creek	
June 1, 1946...	2,000	13¾	......	......	......	......	......	......	......	......	2,000	13¾	Valentine Creek	Rapides
June 2, 1946...	2,000	12¾	......	......	......	......	......	......	......	......	2,000	12¾	Valentine Creek	Rapides
June 3, 1946...	11,161	85	......	......	......	......	......	......	......	......	11,161	85	Alco Creek	Vernon
June 4, 1946...	5,827	45	......	......	......	......	......	......	......	......	5,827	45	Fullerton Lake	Vernon
June 5, 1946...	10,000	78	......	......	......	......	......	......	......	......	10,000	78	Saline Lake	Winn
June 6, 1946...	5,334	40	......	......	......	......	......	......	......	......	5,334	40	Wilson Lake	Red River
June 7, 1946...	5,334	40	......	......	......	......	......	......	......	......	5,334	40	Chas. Horne Lake	Caddo
June 8, 1946...	6,017	45	......	......	......	......	......	......	......	......	6,017	45	Lake End Lake	Red River
June 9, 1946...	6,017	45	......	......	......	......	......	......	......	......	6,017	45	Wilson Lake	Red River
June 10, 1946..	11,070	90	......	......	......	......	......	......	......	......	11,070	90	Lake Bistineau	Bienville
June 18, 1946..	9,630	90	......	......	......	......	......	......	......	......	9,630	90	Spring Bush Lake	Bossier
June 19, 1946..	10,500	90	......	......	......	......	......	......	......	......	10,500	90	Chicot Lake	Evangeline
June 20, 1946..	8,760	90	......	......	......	......	......	......	......	......	8,760	90	Chicot Lake	Evangeline
June 21, 1946..	2,040	32	......	......	......	......	......	......	......	......	2,040	32	Evangeline Lake	Evangeline
July 9, 1946...	6,000	90	......	......	......	......	......	......	......	......	6,000	90	Chicot Lake	Evangeline
July 11, 1946..	9,562	90	......	......	......	......	......	......	......	......	9,562	90	Wilson Lake	Red River
July 11, 1946..	9,562	90	......	......	......	......	......	......	......	......	9,562	90	Clear Lake	Richland
June 24, 1946..	5,000	31	......	......	......	......	......	......	......	......	5,000	31	Saddle Bayou	Winn
June 24, 1946..	5,000	31	......	......	......	......	......	......	......	......	5,000	31	Iron Branch	Winn
June 26, 1946..	9,576	76	......	......	......	......	......	......	......	......	9,576	76	Hoover Lake	Calcasieu
June 27, 1946..	6,456	76½	......	......	......	......	......	......	......	......	6,456	76½	Lake Bistineau	Bienville
June 28, 1946..	6,990	90	......	......	......	......	......	......	......	......	6,990	90	Calcasieu River	Calcasieu
June 29, 1946..	4,234	58	......	......	......	......	......	......	......	......	4,234	58	Gravel Pit Lake	Grant
Apr. 8, 1946...	.....	......	......	......	......	......	......	......	20,000	(Fry)	......	......	Monroe Hatchery	Ouachita

SUMMARY FISH DISTRIBUTION—1946

Natchitoches Fed. Fish Hatchery	L. M. Bass		Perch		Crappie		Striped Bass		Other		Total		Disposition	Parish
	No.	Wt	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
Apr. 9, 1946...	......	......	......	......	......	......	....	......	68,000	(Fry)	......	......	Beechwood Hatc.	Rapides
April 11, 1946..	......	......	......	......	......	......	....	......	28,000	(Fry)	......	......	Lacombe Hatch.	St. Tammany
	180,670	1,688	......	......	......	......	......	....	116,000	(Fry)	180,670 116,000	1,688 (Fry)		
											296,670	Gr. Tot.		
Monroe Fish Hatchery														
Oct. 8, 1946...	16,200	528	......	......	......	......	....	......	......	......	16,200	528	Bayou DeSaird	Ouachita
Oct. 9, 1946...	102	93	5,025	276	......	......	....	......	......	......	5,127	369	Bayou DeSaird	Ouachita
Oct. 10, 1946..	20	6	1,200	76	......	......	....	......	......	......	1,220	82	Bayou DeSaird	Ouachita
	16,322	627	6,225	352	......	......	....	......	......	......	22,547	979		
Beechwood Fish Hatchery														
Nov. 6, 1946...	1,869	83	......	......	......	......	....	......	......	......	1,869	83	Lake Cocodrie	Rapides
Dec. 4, 1946...	2,673	114	......	......	......	......	....	......	......	......	2,673	114	Calcasieu River	Allen
Dec. 5, 1946...	3,241	120	......	......	......	......	....	......	......	......	3,241	120	Cane River	Natchitoches
Dec. 6, 1946...	3,229	159	......	......	......	......	....	......	......	......	3,229	159	Lake Charles	Calcasieu
Dec. 7, 1946...	2,288	280	......	......	......	......	....	......	......	......	2,288	280	Lake Charles	Calcasieu
Dec. 9, 1946...	5,000	140	......	......	......	......	....	......	......	......	5,000	140	Chicot Park	Evangeline
Dec. 10, 1946..	3,565	154	......	......	......	......	....	......	......	......	3,565	154	Birchwitch Creek	Beauregard
Dec. 10, 1946..	3,500	98	......	......	......	......	....	......	......	......	3,500	98	Indian Creek	Rapides
	25,365	1,148	......	......	......	......	....	......	......	......	25,365	1,148		

SUMMARY FISH DISTRIBUTION—1946

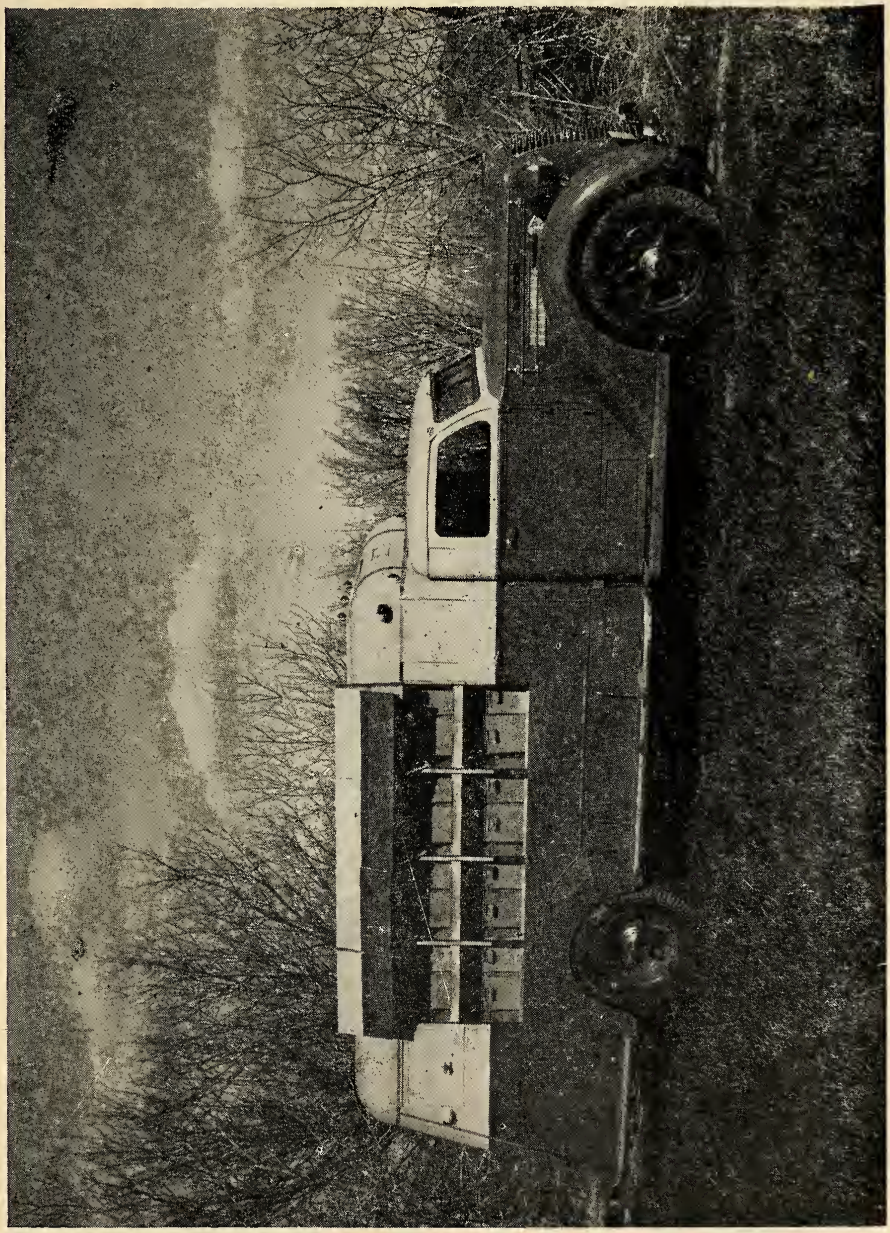
Barrow Pits	L. M. Bass		Perch		Crappie		Striped Bass		Other		Total		Disposition	Parish
Rapides	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
July 24, 1946..	15	30	......	......	250	104	.....	......	......	......	265	134	Leesville, La.	Vernon
July 24, 1946..	14	14	......	......	100	50	.....	......	......	......	114	64	Fishville Creek	
July 25, 1946..	16	18	......	......	276	91	.....	......	......	......	292	109	Concordia Lake	Concordia
July 29, 1946..	.....	......	......	......	234	59	.....	......	......	......	234	59	Kinkade Lake	Rapides
July 29, 1946..	.....	......	......	......	220	56	.....	......	......	......	220	56	Hemphill Creek	Rapides
July 30, 1946..	.....	......	......	......	367	97	.....	......	......	......	367	97	Hospital Lake	Rapides
July 31, 1946..	2	3	......	......	275	68	.....	......	......	......	277	71	Kinkade Lake	Rapides
(Natchitoches)														
Aug. 1, 1946...	41	14	......	......	343	87	.....	......	......	......	384	101	Haynesville	Claiborne
(Tensas)														
Aug. 6, 1946...	4	2	......	......	440	56	.....	......	......	......	444	58	Annacoa Creek	Vernon
Aug. 7, 1946...	8	3½	......	......	395	52	.....	......	......	......	403	55½	Annacoa Creek	Vernon
Aug. 8, 1946...	9	4	......	......	875	92	.....	......	......	......	884	96	Lake Despair	Madison
Aug. 9, 1946...	10	3	......	......	871	112	.....	......	......	......	881	115	Whiskey Chitta	Beauregard
Aug. 12, 1946..	5	1½	......	......	436	112	.....	......	......	......	441	113½	Bear Lake	Madison
Aug. 13, 1946..	4	2	......	......	421	110	.....	......	......	......	425	112	Bear Lake	Madison
Aug. 14, 1946..	15	6	......	......	672	106	.....	......	......	......	687	112	Lafourche	Morehouse
Aug. 15, 1946..	3	1¾	......	......	375	91	.....	......	......	......	378	92¾	Clear Lake	Richland
Aug. 16, 1946..	5	4	......	......	352	108	.....	......	......	......	357	112	Clear Lake	Richland
Aug. 17, 1946..	3	3	......	......	320	109	.....	......	......	......	323	112	Lafourche	Morehouse
Aug. 19, 1946..	7	4½	......	......	400	102	.....	......	......	......	407	106½	Lake Bruin	Tensas
Aug. 20, 1946..	5	3	......	......	560	96	.....	......	......	......	565	99	Lake Edwards	Jackson
Aug. 21, 1946..	8	5	......	......	540	97	.....	......	......	......	548	102	Lake Lafourche	Richland
Aug. 22, 1946..	12	9	......	......	490	91	.....	......	......	......	502	100	Calcasieu	Allen
Aug. 23, 1946..	7	6	......	......	420	98	.....	......	......	......	427	104	Bear Lake	Madison
Aug. 26, 1946..	8	6	......	......	640	102	.....	......	......	......	648	108	Bear Lake	Madison
Aug. 29, 1946..	9	6	......	......	320	75	.....	......	......	......	329	81	Lake Bruin	Tensas
Sept. 3, 1946..	10	8	......	......	2,300	300	.....	......	......	......	2,310	308	DeRidder	Beauregard
Sept. 3, 1946..	2	2	......	......	420	90	.....	......	......	......	422	92	Lake Bruin	Tensas
Sept. 4, 1946..	7	5	......	......	415	90	.....	......	......	......	422	95	Lake Bruin	Tensas
Sept. 5, 1946..	28	16	......	......	1,440	200	.....	......	......	......	1,468	216	Oakdale	Allen
Sept. 6, 1946..	9	4	......	......	475	90	.....	......	......	......	484	94	Lake Bruin	Tensas

SUMMARY FISH DISTRIBUTION—1946

Barrow	L. M. Bass		Perch		Crappie		Striped Bass		Other		Total		Disposition	Parish
Pits—Cont.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
(East Carroll)														
Sept. 9, 1946..	75	60	......	......	850	175	.....	......	......	......	925	235	Lake Providence	East Carroll
Sept. 10, 1946..	140	125	......	......	1,450	250	.....	......	......	......	1,590	375	Whiskey Chitta	Beauregard
Sept. 11, 1946..	40	37	......	......	220	80	.....	......	......	......	260	117	Lake Providence	East Carroll
Sept. 12, 1946..	60	55	......	......	230	81	.....	......	......	......	290	136	Lake Providence	East Carroll
Sept. 14, 1946..	150	85	......	......	2,500	140	.....	......	......	......	2,650	225	Lake Providence	East Carroll
Sept. 17, 1946..	242	276	......	......	930	203	.....	......	......	......	1,172	479	University Lake	E. Bat. Rouge
Sept. 18, 1946..	37	51	......	......	1,000	200	.....	......	......	......	1,037	251	Lake Providence	East Carroll
Sept. 21, 1946..	12	21	......	......	800	145	.....	......	......	......	812	166	Lake Providence	East Carroll
Oct. 22, 1946...	11	9	......	......	624	205	.....	......	......	......	635	214	Lake Providence	East Carroll
Oct. 23, 1946...	5	2	......	......	1,291	446	.....	......	......	......	1,296	448	Tangipahoa River	Tangipahoa
Oct. 24, 1946...	3	1	......	......	670	263	.....	......	......	......	673	264	Lake Providence	East Carroll
Oct. 28, 1946...	16	7	......	......	2,075	476	.....	......	......	......	2,091	483	Kernan Lake	E. Bat. Rouge
Oct. 29, 1946...	13	9	......	......	565	197	.....	......	......	......	578	206	Lake Providence	East Carroll
Oct. 30, 1946...	7	4	......	......	472	164	.....	......	......	......	479	168	Lake Providence	East Carroll
Oct. 31, 1946...	24	21	......	......	976	441	.....	......	......	......	1,000	462	Horse Shoe Lake	Avoyelles
Nov. 1, 1946...	30	10	......	......	350	115	.....	......	......	......	380	125	Lake Providence	East Carroll
Nov. 2, 1946...	45	20	......	......	790	230	.....	......	......	......	835	250	Lake Providence	East Carroll
(Natchitoches)														
Nov. 26, 1946..	146	46	......	......	1,328	221	.....	......	......	......	1,474	267	Cane River	Natchitoches
	1,883	1,362¼	......	......	51,443	9,616	3	½	......	......	53,329	10,978¾		

SUMMARY FISH DISTRIBUTION—1946

	L. M. Bass		Perch		Crappie		Striped Bass		Other		Total		Disposition	Parish
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
Lacombe Fish Hatchery														
Dec. 17, 1946..	400	140	......	......	......	......	....	......	......	......	400	140	Abita River	St. Tammany
Dec. 17, 1946..	1,600	215	......	......	......	......	...	......	......	......	1,600	215	Tangipahoa River	Tangipahoa
Dec. 18, 1946..	2,020	260	......	......	......	......	....	......	......	......	2,020	260	Bogue Chitta	Washington
Dec. 19, 1946..	1,280	260	......	......	......	......	....	......	......	......	1,280	260	Angelo	Washington
Dec. 20, 1946..	1,600	148	......	......	......	......	....	......	......	......	1,600	148	Bayou Liberty	St. Tammany
Dec. 21, 1946..	......	......	2,050	205	......	......	...	......	......	......	2,050	205	Bayou Lacombe	St. Tammany
Dec. 21, 1946..	1,275	128	2,100	210	......	......	....	......	......	......	3,375	338	Tchefuncte River	St. Tammany
Dec. 21, 1946..	970	100	3,000	300	......	......	....	......	......	......	3,970	400	Bogue Falaya R.	St. Tammany
	9,145	1,251	7,150	715	......	......	....	......	......	......	16,295	1,966		
Grand Total, 1946	233,385	6,076¼	13,375	1,067	51,443	9,616	3	½	116,000	(Fry)	298,206 116,000	16,759¾ (Fry)		
											414,206			



Live fish transportation truck 40 can unit.

L. Lib La.

SUMMARY FISH DISTRIBUTION—1947

	L. M. Bass		Perch		Crappie		Striped Bass		Other		Total		Disposition	Parish
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
Barrow Pits (Tensas)														
Feb. 19, 1947..	56	41	......	......	1,260	414	.....	......	......	......	1,316	455	Chicot Park	Evangeline
April 2, 1947...	17	18	......	......	700	120	.....	......	......	......	717	138	Lake Bruin	Tensas
July 22, 1947..	300	60	2,200	245	......	......	.....	......	......	......	2,500	305	Moon Lake	Bossier
July 24, 1947..	475	60	1,200	120	......	......	.....	......	......	......	1,675	180	Lake Bruin	Tensas
July 25, 1947..	180	95	1,300	207	......	......	.....	......	......	......	1,480	302	Calcasieu River	Allen
July 28, 1947..	190	41	......	......	460	200	.....	......	......	......	650	241	Alto Lake	Vernon
July 29, 1947..	940	90	......	......	1,260	175	.....	......	......	......	2,200	265	Lake Bruin	Tensas
July 30, 1947..	225	60	......	......	450	190	.....	......	......	......	675	250	Ten Mile Creek	Allen
Aug. 1, 1947...	350	88	......	......	320	105	.....	......	......	......	670	193	Lake Bruin	Tensas
Aug. 4, 1947...	370	119	......	......	647	121	.....	......	......	......	1,017	240	Six Mile Creek	Allen
Aug. 5, 1947...	203	91	......	......	790	164	.....	......	......	......	993	255	Lake Bruin	Tensas
Aug. 6, 1947...	301	106	......	......	412	102	.....	......	......	......	713	208	Lake Despair	Madison
(Natchitoches)														
July 15, 1947..	31	9	460	130	......	......	.....	......	......	......	491	139	Cane River	Natchitoches
July 17, 1947..	164	94	1,275	312	......	......	.....	......	......	......	1,439	406	Cane River	Natchitoches
(East Carroll)														
Aug. 8, 1947...	603	126	......	......	3,614	471	.....	......	......	......	4,217	597	Bayou DeSaird	Ouachita
Aug. 9, 1947...	205	72	......	......	420	130	.....	......	......	......	625	202	Lake Providence	East Carroll
Aug. 11, 1947..	43	37	......	......	590	204	.....	......	......	......	633	241	Lake Providence	East Carroll
Aug. 12, 1947..	312	91	......	......	1,340	314	.....	......	......	......	1,652	405	Edward's Lake	Jackson
Aug. 16, 1947..	84	89	......	......	793	321	35	34	......	......	912	444	Lake Providence	East Carroll
Aug. 18, 1947..	117	63	......	......	927	214	.....	......	......	......	1,044	277	Clear Lake	Richland
Aug. 19, 1947..	4	6	......	......	197	190	.....	......	122	120	323	316	Calcasieu River	Allen
Aug. 21, 1947..	112	41	......	......	323	94	.....	......	6	48	441	183	Lake Providence	East Carroll
Aug. 21, 1947..	38	41	......	......	650	308	.....	......	......	......	688	349	Bayou DeSaird	Ouachita
Aug. 21, 1947..	9	2	......	......	17	4	.....	......	118	660	144	666	Lake Providence	East Carroll
Aug. 22, 1947..	13	12	......	......	551	127	11	14	......	......	575	153	Country Club Lake	Ouachita
Aug. 23, 1947..	14	16	......	......	481	111	4	6	......	......	499	133	Lake Providence	East Carroll
Aug. 25, 1947..	187	374	......	......	1,019	276	55	27	......	......	1,261	677	Lake Providence	East Carroll
Aug. 26, 1947..	278	538	......	......	1,867	889	.....	......	......	......	2,145	1,427	Lake Lafourche	Morehouse
Aug. 27, 1947..	152	217	......	......	300	278	.....	......	......	......	452	495	Clear Lake	Richland

SUMMARY FISH DISTRIBUTION—1947

	L. M. Bass		Perch		Crappie		Striped Bass		Other		Total		Disposition	Parish
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
Barrow Pits (East Carroll)														
Aug. 27, 1947..	21	47	.....	.....	773	228	.....	.....	.....	.....	794	275	Lake Providence	East Carroll
Aug. 28, 1947..	115	327	.....	.....	586	213	.....	.....	.....	.....	701	540	Lake Lafourche	Morehouse
Aug. 28, 1947..	88	91	.....	.....	2,354	512	.....	.....	.....	.....	2,442	603	Lake Providence	East Carroll
Aug. 29, 1947..	213	490	.....	.....	1,410	824	.....	.....	.....	.....	1,623	1,314	Bear Lake	Madison
Aug. 30, 1947..	117	201	.....	.....	1,175	522	.....	.....	.....	.....	1,292	723	Lake Providence	East Carroll
Sept. 2, 1947..	166	167	.....	.....	1,650	495	.....	.....	.....	.....	1,816	662	Lake Erwin	Morehouse
Sept. 2, 1947..	28	24	.....	.....	1,045	312	.....	.....	.....	.....	1,073	336	Lake Providence	East Carroll
Sept. 3, 1947..	76	78	.....	.....	350	334	.....	.....	.....	.....	426	412	Calcasieu River	Allen
Sept. 3, 1947..	61	47	.....	.....	1,037	254	.....	.....	.....	.....	1,098	301	Lake Lafourche	Morehouse
Sept. 4, 1947..	86	84	.....	.....	1,126	647	.....	.....	.....	.....	1,212	731	Lake Providence	East Carroll
Sept. 5, 1947..	96	135	.....	.....	501	250	.....	.....	.....	.....	597	385	Chicot Lake	Evangeline
Sept. 5, 1947..	61	50	.....	.....	856	375	.....	.....	.....	.....	917	425	Bear Lake	Madison
Sept. 8, 1947..	147	84	.....	.....	2,045	721	.....	.....	.....	.....	2,192	805	Edward's Lake	Jackson
Sept. 8, 1947..	122	91	.....	.....	1,028	279	.....	.....	.....	.....	1,150	370	Lake Providence	East Carroll
Sept. 9, 1947..	142	123	.....	.....	1,678	721	.....	.....	.....	.....	1,820	844	Lake Bruin	Tensas
Sept. 11, 1947..	94	86	.....	.....	917	378	.....	.....	.....	.....	1,011	464	Lake Bruin	Tensas
Sept. 12, 1947..	27	21	.....	.....	1,072	564	.....	.....	.....	.....	1,099	585	Lake Bruin	Tensas
Sept. 16, 1947..	121	102	.....	.....	914	463	.....	.....	.....	.....	1,035	565	Lake Providence	East Carroll
Sept. 17, 1947..	114	128	.....	.....	1,190	516	.....	.....	.....	.....	1,304	644	Lake Providence	East Carroll
Sept. 19, 1947..	150	321	.....	.....	910	668	.....	.....	.....	.....	1,060	989	Calcasieu River	Calcasieu
Sept. 22, 1947..	30	60	.....	.....	250	250	.....	.....	.....	.....	280	310	Evangeline Park	St. Martin
Sept. 22, 1947..	70	65	.....	.....	475	320	.....	.....	.....	.....	545	385	Lake Providence	East Carroll
Sept. 24, 1947..	43	28	.....	.....	720	321	.....	.....	.....	.....	763	349	Lake Providence	East Carroll
Sept. 25, 1947..	125	205	.....	.....	375	360	.....	.....	.....	.....	500	565	Reservoir	Cameron
Sept. 25, 1947..	143	46	.....	.....	1,878	463	.....	.....	.....	.....	2,021	509	Lake Providence	East Carroll
Sept. 26, 1947..	62	41	.....	.....	1,720	617	.....	.....	.....	.....	1,782	658	Lake Providence	East Carroll
Sept. 29, 1947..	20	19	.....	.....	1,600	425	.....	.....	.....	.....	1,620	444	Lake Providence	East Carroll
Sept. 29, 1947..	35	34	.....	.....	2,500	921	.....	.....	.....	.....	2,535	955	Clear Lake	Richland
Sept. 30, 1947..	65	128	.....	.....	330	311	.....	.....	.....	.....	395	439	Reservoir	St. Mary
Oct. 2, 1947...	60	121	.....	.....	200	198	.....	.....	.....	.....	260	319	Calcasieu River	Allen
Oct. 2, 1947...	15	14	.....	.....	425	201	.....	.....	.....	.....	440	215	Lake Providence	East Carroll
Oct. 3, 1947...	7	4	.....	.....	475	150	.....	.....	.....	.....	482	154	Lake Providence	East Carroll

SUMMARY FISH DISTRIBUTION—1947

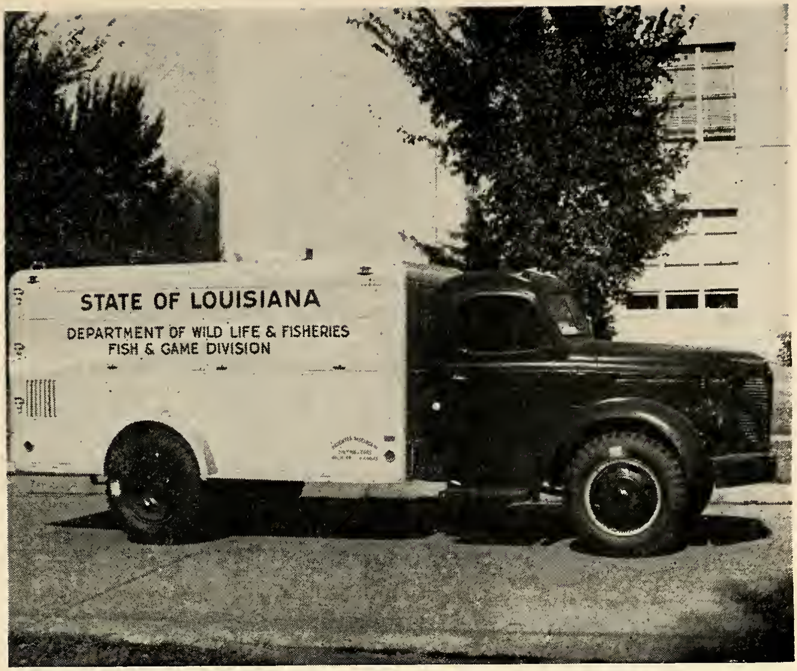
	L. M. Bass		Perch		Crappie		Striped Bass		Other		Total		Disposition	Parish
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
Barrow Pits (East Carroll)														
Oct. 3, 1947	28	14			392	250					420	264	Lake Edward's	Jackson
Oct. 6, 1947	65	114			240	210					305	324	Abita River	St. Tammany
Oct. 6, 1947					300	70					300	70	Lake Providence	East Carroll
Oct. 8, 1947	90	154			537	437			739	210	1,366	801	Cheniere Lake	Ouachita
Oct. 9, 1947	40	24			585	204			500	147	1,125	375	Cheniere Lake	Ouachita
Oct. 10, 1947	2	5			678	234					680	239	Lake Providence	East Carroll
Oct. 14, 1947	61	100			775	402			620	123	1,456	625	Cheniere Lake	Ouachita
Oct. 16, 1947	12	11			600	301					612	312	Lake Providence	East Carroll
Oct. 17, 1947	51	94			615	312			325	110	991	516	Cheniere Lake	Ouachita
Oct. 20, 1947	104	78			1,060	402					1,164	480	Cheniere Lake	Ouachita
Oct. 22, 1947	101	90			1,410	520					1,511	610	Cane River	Natchitoches
Oct. 24, 1947	162	178			2,000	600					2,162	778	Cane River	Natchitoches
Oct. 24, 1947	1	8									1	8	Lake Providence	East Carroll
(Forest Mill Pond, Allen)														
July 2, 1947	350	65									350	65	Calcasieu River	Allen
July 2, 1947			275	55							275	55	Calcasieu River	Allen
(Dr. Salvo—Evangeline)														
Aug. 14, 1947	154	207			223	61					377	268	Chicot Lake	Evangeline
	9,914	7,301	6,710	1,069	62,368	23,338	105	81	2,430	1,418	81,527	33,207		
Natchitoches Federal Fish Hatchery														
Apr. 22, 1947									60,000	(Fry)			Beechw'd Fish H.	Rapides
Apr. 22, 1947									28,000	(Fry)			Lacombe Fish H.	St. Tammany
Apr. 22, 1947									84,000	(Fry)			Monroe Fish H.	Ouachita
June 10, 1947	13,100	81¼									13,100	81¼	University Lake	E. Baton Rouge
June 12, 1947	12,160	76½									12,160	76½	Girl Scout Lake	Bienville
June 13, 1947	4,051	84½									4,051	84½	Lake Iatt	Grant

SUMMARY FISH DISTRIBUTION—1947

Natchitoches Fed. Fish Hatchery—Cont.	L. M. Bass		Perch		Crappie		Striped Bass		Other		Total		Disposition	Parish
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
June 17, 1947..	10,760	92	......	......	......	......	....	......	......	......	10,760	92	Evangeline St. Pk.	Evangeline
June 19, 1947..	12,075	93	......	......	......	......	....	......	......	......	12,075	93	Fillerton Lake	Vernon
June 20, 1947..	9,400	70½	......	......	......	......	....	......	......	......	9,400	70½	Lake Bistineau	Bienville
June 24, 1947..	9,350	93¾	......	......	......	......	....	......	......	......	9,350	93¾	Lake Bistineau	Bienville
June 25, 1947..	9,050	90	......	......	......	......	....	......	......	......	9,050	90	Lake Bistineau	Bienville
June 27, 1947..	8,410	94¼	......	......	......	......	....	......	......	......	8,410	94¼	Lake Bistineau	Bienville
June 30, 1947..	9,883	105	......	......	......	......	....	......	......	......	9,883	105	Black Lake	Natchitoches
July 1, 1947...	10,030	94	......	......	......	......	....	......	......	......	10,030	94	Black Lake	Natchitoches
July 3, 1947...	12,040	112¾	......	......	......	......	....	......	......	......	12,040	112¾	Black Lake	Natchitoches
July 8, 1947...	11,474	96¾	......	......	......	......	....	......	......	......	11,474	96¾	Black Lake	Natchitoches
July 9, 1947...	9,250	92½	......	......	......	......	....	......	......	......	9,250	92½	Lake Bistineau	Bienville
July 10, 1947..	5,280	64	......	......	......	......	....	......	......	......	5,280	64	Beechwood Hatc.	Rapides
	146,313	1,340¾	......	......	......	......	...	......	172,000	(Fry)	146,313 172,000 318,313	1,340¾ (Fry)		
Monroe Fish Hatchery														
Nov. 3, 1947...	15,600	390	......	......	......	......	....	......	......	......	15,600	390	Bayou DeSaird	Ouachita
Nov. 4, 1947...	172	192	2,489	415	......	......	....	......	......	......	2,661	607	Cheniere Lake	Ouachita
Nov. 5, 1947...	28	14	1,710	128	......	......	....	......	......	......	1,738	142	Bayou DeSaird	Ouachita
Nov. 6, 1947...	814	59	2,105	189	......	......	....	......	......	......	2,919	248	Cheniere Lake	Ouachita
Nov. 6, 1947...	360	54	1,800	117	......	......	....	......	......	......	2,160	171	Bayou DeSaird	Ouachita
	16,974	709	8,104	849	......	......	....	......	......	......	25,078	1,558		
Beechwood Fish Hatchery														
July 14, 1947..	500	15	500	9	......	......	....	......	......	......	1,000	24	Camp Brewer	Rapides
July 14, 1947..	3,000	90	11,500	203	......	......	....	......	......	......	14,500	293	Cocodrie Lake	Rapides
Nov. 21, 1947..	4,445	181	......	......	......	......	....	......	......	......	4,445	181	Whiskey Chitto C.	Allen

SUMMARY FISH DISTRIBUTION—1947

Beechwood Fish Hatchery—Cont.	L. M. Bass		Perch		Crappie		Striped Bass		Other		Total		Disposition	Parish
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.		
Nov. 24, 1947.	3,440	119	......	......	......	......	....	......	......	......	3,440	119	Cocodrie Lake	Rapides
Nov. 24, 1947.	2,900	60	2,980	45	......	......	....	......	......	......	5,880	105	Dossman Lake	Evangeline
Nov. 26, 1947.	191	120	......	......	......	......	....	......	......	......	191	120	Calcasieu River	Calcasieu
Nov. 26, 1947.	2,320	108	......	......	......	......	....	......	......	......	2,320	108	Weeks, La.	Iberia
Nov. 27, 1947.	2,230	100	......	......	......	......	....	......	......	......	2,230	100	Bundick Creek	Beauregard
Nov. 27, 1947.	2,232	100	......	......	......	......	....	......	......	......	2,232	100	Beckwith Creek	Calcasieu
Nov. 27, 1947.	2,108	91	......	......	......	......	....	......	......	......	2,108	91	Anacoco Creek	Vernon
Nov. 28, 1947.	4,254	132	2,000	10	......	......	....	......	......	......	6,254	142	Spring Creek	Rapides
Nov. 28, 1947.	3,280	120	......	......	......	......	....	......	......	......	3,280	120	Indian Creek	Rapides
	30,900	1,236	16,980	267	......	......	....	......	......	......	47,880	1,503		
Lacombe Fish Hatchery														
Dec. 9, 1947..	1,229	87	......	......	......	......	....	......	......	......	1,229	87	Abita River	St. Tammany
Dec. 16, 1947..	765	90	......	......	......	......	....	......	......	......	765	90	Bogue Lusa Creek	Washington
Dec. 16, 1947.	765	90	......	......	......	......	....	......	......	......	765	90	Pushapatapa Cr.	Washington
Dec. 17, 1947.	5,340	400	......	......	......	......	....	......	......	......	5,340	400	Bogue Chitta Riv.	Washington
Dec. 17, 1947.	700	100	......	......	......	......	....	......	......	......	700	100	Bogue Falaya R.	St. Tammany
Dec. 17, 1947.	1,260	180	......	......	......	......	....	......	......	......	1,260	180	Tchefuncte Riv.	St. Tammany
Dec. 18, 1947.	5,460	600	......	......	......	......	....	......	......	......	5,460	600	Tangipahoa	Tangipahoa
	15,519	1,547	......	......	......	......	....	......	......	......	15,519	1,547		
Grand Total, 1947	219,620	12,133¾	31,794	2,185	62,368	23,338	105	81	2,430	1,418	316,317	39,155¾		
									172,000	(Fry)	172,000	(Fry)		
									174,430		488,317			



Live fish transportation truck 18 can unit.

CATCH AND LICENSES

Lake Bruin Fish Preserve

	Licenses		Species	
Month	Non-Resident	Resident	Bass	Crappie
	1946			
January	57	17	382	225
June	279	208	2,053	2,335
July	311	271	1,995	2,556
August	229	148	1,779	1,715
September	247	163	2,587	1,728
October	220	141	1,843	1,850
November	169	71	1,299	1,087
December	122	44	1,107	458
TOTAL, 1946	1,634	1,063	13,045	11,954

(No patrolling February, March, April and May due to Tensas Parish Police Jury's refusal to continue cooperative work on Lake Bruin.)

	1947			
January	99	42	610	407
February	156	75	1,129	1,107
May	705	526	5,625	5,307
June	480	414	2,627	5,855
July	278	324	2,159	3,469
August	200	373	1,936	3,478
September	171	133	1,257	1,419
October	208	138	1,719	1,573
November	174	60	962	904
December	59	14	357	195
TOTAL, 1947	2,530	2,099	18,381	23,714

QUAIL DISTRIBUTION—1946

SPRING DISTRIBUTION

DATE	NUMBER	DISPOSITION
L. S. U. QUAIL HATCHERY		
4/1/46	240	*C. J. Perkins, Elizabeth, La., Allen Parish
4/2/46	72	*R. P. Vernon, Ruston, La., Lincoln Parish
4/3/46	12	E. H. Guillory, Ville Platte, La., Evangeline Parish
4/6/46	60	*James Brown, Clinton, La., East Feliciana Parish
4/8/46	72	*C. J. Perkins, Elizabeth, La., Allen Parish
4/9/46	72	*R. P. Vernon, Ruston, La., Lincoln Parish
4/9/46	60	Roy Terry, Shreveport, La., Caddo Parish
4/10/46	36	R. L. Hubert, Plaquemine, La., Iberville Parish
4/10/46	36	Paul Schreier, Morgan City, La., St. Mary Parish
4/10/46	60	Dr. Guy G. Aycock, Franklin, La., St. Mary Parish
4/10/46	30	G. O. Pharr, New Iberia, La., Iberia Parish
4/10/46	60	E. D. Peckham, Crowley, La., Acadia Parish
4/10/46	18	A. J. Resweber, Jennings, La., Jefferson Davis Parish
4/10/46	36	C. N. Taylor, Jennings, La., Jefferson Davis Parish
4/10/46	60	C. B. Goodreau, Jennings, La., Jefferson Davis Parish
4/10/46	60	J. A. Partridge, Lake Charles, La., Calcasieu Parish
4/10/46	60	Robert James, Lake Charles, La., Calcasieu Parish
4/10/46	60	W. A. K. Seale, Sulphur, La., Calcasieu Parish
4/11/46	60	A. J. Morgan, New Roads, La., Pointe Coupee Parish
4/12/46	18	Ovide LaCour III, LaCour, La., Pointe Coupee Parish
4/12/46	30	Roy D. Johnson, Bunkie, La., Avoyelles Parish
4/12/46	60	Willard Beeson, Oakdale, La., Allen Parish
4/12/46	60	F. E. Hernandez, Leesville, La., Vernon Parish
4/12/46	60	Stuart S. Kay, DeRidder, La., Beauregard Parish
4/12/46	30	P. W. West, DeRidder, La., Beauregard Parish
4/15/46	72	*C. J. Perkins, Elizabeth, La., Allen Parish
4/15/46	120	J. V. McConnell, Shreveport, La., Caddo Parish

Quail in holding pens ready for spring distribution.

QUAIL DISTRIBUTION—1946

SPRING DISTRIBUTION

DATE	NUMBER	DISPOSITION
4/15/46	36	P. E. Furlow, Shreveport, La., Caddo Parish (Distributed, Webster Parish)
4/15/46	60	Jack Stanfield, Minden, La., Webster Parish
4/16/46	60	W. I. Hair, Winnsboro, La., Franklin Parish
4/16/46	60	J. A. Combs, Monroe, La., Ouachita Parish
4/16/46	30	J. C. Wilkerson, Newellton, La., Tensas Parish
4/16/46	30	W. L. Madison, Bastrop, La., Morehouse Parish
4/16/46	18	J. C. Liner, Monroe, La., Ouachita Parish
4/16/46	72	*R. P. Vernon, Ruston, La., Lincoln Parish
4/20/46	12	F. F. Gaines, Baton Rouge, La., East Baton Rouge Parish
4/20/46	12	Jack Atkinson, Baton Rouge, La., East Baton Rouge Parish

QUAIL DISTRIBUTION—1946

SPRING DISTRIBUTION

DATE	NUMBER	DISPOSITION
4/20/46	12	Millard S. Perkins, Baton Rouge. La., East Baton Rouge Parish
4/20/46	12	Albert J. Cook, Baton Rouge, La., East Baton Rouge Parish.
4/20/46	12	Lawrence J. Mahoney, Pride, La., East Baton Rouge Parish
4/20/46	12	E. F. Fleming, Jr., Baton Rouge, La., East Baton Rouge Parish
4/20/46	12	Henry Fontenot, Baton Rouge, La., East Baton Rouge Parish
4/20/46	12	Tom D'Aquin, Baton Rouge, La., East Baton Rouge Parish.
4/20/46	12	J. Norman Efferson, Baton Rouge, E. Baton Rouge Parish
4/20/46	12	Fred Parnell, Baton Rouge, La., East Baton Rouge Parish
4/20/46	12	Joe Lipsey, Baton Rouge, La., East Baton Rouge Parish
4/20/46	12	N. A. Maestri, Baton Rouge, La., East Baton Rouge Parish
4/20/46	12	M. Wilson, Baton Rouge, La., East Baton Rouge Parish
4/20/46	12	P. V. Goudeau, Baton Rouge, La., East Baton Rouge Parish
4/20/46	12	W. C. Henderson, Baton Rouge, La., East Baton Rouge Parish
4/20/46	12	C. P. Hansen, Baton Rouge, La., East Baton Rouge Parish
4/20/46	12	Harry Waugh, Baton Rouge, La., East Baton Rouge Parish
4/20/46	12	R. Downes, Baton Rouge, La., East Baton Rouge Parish
4/20/46	12	Dr. Arthur Prescott, Baton Rouge, La., East Baton Rouge Parish
4/20/46	12	Paul S. Haygood, Baton Rouge, La., East Baton Rouge Parish
4/20/46	12	O. M. Pourciau, Baton Rouge, La., East Baton Rouge Parish
4/20/46	12	U. P. Hicks, Baton Rouge, La., East Baton Rouge Parish
4/20/46	12	Sterling Merrill, Baton Rouge La., East Baton Rouge Parish
4/20/46	12	Harry Roppolo, Baton Rouge, La., East Baton Rouge Parish
4/20/46	12	Albert C. Koenig, Baton Rouge, La., East Baton Rouge Parish
4/20/46	12	Adolph S. Hanks, Baton Rouge, La., East Baton Rouge Parish
4/20/46	12	Bill Adcock, Baton Rouge, La., East Baton Rouge Parish
4/20/46	12	Jack Autin, Loranger La., Tangipahoa Parish
4/20/46	12	V. Edgar Smith Loranger, La., Tangipahoa Parish

QUAIL DISTRIBUTION—1946

SPRING DISTRIBUTION

DATE	NUMBER	DISPOSITION
4/20/46	12	Dr. J. W. Andrews, Independence, La., Tangipahoa Parish
4/20/46	12	Jerry Beeson, Baton Rouge, La., East Baton Rouge Parish
4/20/46	12	J. M. Ross, Baton Rouge, La., East Baton Rouge Parish
4/20/46	12	L. P. Amiss, Baton Rouge, La., East Baton Rouge Parish
4/20/46	12	Roger Combell Baton Rouge, La., East Baton Rouge Parish
4/20/46	12	Walter Cranfield, Baton Rouge, La., East Baton Rouge Parish
4/20/46	12	H. D. Salassi, Baton Rouge, La., East Baton Rouge Parish
4/20/46	12	J. Barker Landry, Baton Rouge, La., East Baton Rouge Parish
5/1/46	118	J. K. Petrie, Baton Rouge, La., East Baton Rouge Parish
TOTAL L. S. U.	2,542	
LACOMBE QUAIL HATCHERY		
3/11/46	120	*J. S. Campbell, East Feliciana Parish
3/22/46	120	*J. S. Campbell, St. Helena Parish
4/5/46	6	L. Darenprett, Ponchatoula, La., Tangipahoa Parish
4/5/46	6	A. O. Jones, Ponchatoula, La., Tangipahoa Parish
4/5/46	18	H. J. Laujne, Ponchatoula, La., Tangipahoa Parish
4/5/46	24	Geo. M. Banptran, Baptist, La., Tangipahoa Parish
4/5/46	12	R. D. Bradley, Ponchatoula, La., Tangipahoa Parish
4/5/46	6	M. H. Cooper, Ponchatoula, La., Tangipahoa Parish
4/5/46	12	B. Edwards, Ponchatoula, La., Tangipahoa Parish
4/5/46	6	W. F. Wilson, Jr., Experiment Station
4/5/46	60	W. S. Hinson, Independence, La., Tangipahoa Parish
4/11/46	6	B. N. Millet, LaPlace, La., St. John the Baptist Parish
4/11/46	6	Emile Clement, LaPlace, La., St. John the Baptist Parish
4/11/46	12	Reine Vicknair, LaPlace, La., St. John the Baptist Parish
4/11/46	6	Mrs. Juliette O. Maurin, LaPlace, La., St. John the Baptist Parish

QUAIL DISTRIBUTION—1946

SPRING DISTRIBUTION

DATE	NUMBER	DISPOSITION
4/11/46	12	E. J. Guidry, Lions, La., St. John the Baptist Parish
4/11/46	12	Anthony Monica, Jr., Garyville, La., St. John the Baptist Parish
4/11/46	12	H. D. Bourgeois, Mt. Airy, La., St. John the Baptist Parish
4/11/46	6	E. O. Daigle, Reserve, La., St. John the Baptist Parish
4/15/46	12	Charles Bennett, Loranger, La., Tangipahoa Parish
4/15/46	12	D. Bohans, Loranger, La., Tangipahoa Parish
4/15/46	6	Harold Puls, Independence, La., Tangipahoa Parish
4/15/46	12	E. E. Himel, Loranger, La., Tangipahoa Parish
4/15/46	6	N. Zalar, Loranger, La., Tangipahoa Parish
4/15/46	6	R. P. Vaughan, Loranger, La., Tangipahoa Parish
4/15/46	12	Alvis Berne, Loranger, La., Tangipahoa Parish
4/15/46	12	D. A. Ahlman, Loranger, La., Tangipaho Parish
4/15/46	12	Woodrow Carriere, Loranger, La., Tangipahoa Parish
4/22/46	60	W. S. Hinson, Ponchatoula, La., Tangipahoa Parish
4/29/46	90	Sam Bernette, Alexandria, La., Rapides Parish
4/30/46	30	Dave Wlison, Tallulah, La., Madison Parish
4/30/46	15	Rubin Green, Tallulah, La., Madison Parish
4/30/46	15	Sylvester Rayford, Tallulah, La., Madison Parish
5/13/46	12	E. B. Millet, Denham Springs, La., Livingston Parish
5/13/46	36	W. J. Gill, Amite, La., Tangipahoa Parish
5/13/46	12	J. H. McAdam, Denham Springs, La., Livingston Parish
5/13/46	12	W. M. Dawkins, Denham Springs, La., Livingston Parish
5/13/46	50	Dr. Ernest Angelo, Bogalusa, La., Washington Parish
TOTAL LACOMBE	884	

TOTAL SPRING DISTRIBUTION:

L. S. U.	2,542
LACOMBE	884
	3,426

QUAIL DISTRIBUTION—1946

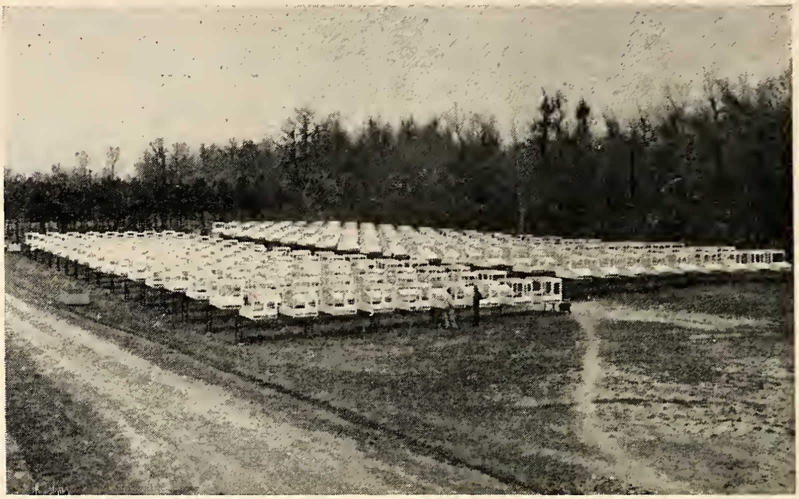
FALL DISTRIBUTION

DATE	NUMBER	DISPOSITION
LACOMBE QUAIL HATCHERY		
9/24/46	60	Dudley H. Weaver, Covington, La., St. Tammany Parish
12/10/46	200	Ernest Angelo, Bogalusa, La., Washington Parish
TOTAL LACOMBE	260	
L. S. U. QUAIL HATCHERY		
9/17/46	240	*C. J. Perkins, Elizabeth, La., Allen Parish
9/23/46	240	*R. P. Vernon, Ruston, La., Lincoln Parish
10/17/46	240	*C. J. Perkins, Elizabeth, La., Allen Parish
10/29/46	240	*R. P. Vernon, Ruston, La., Lincoln Parish
10/31/46	30	Ernest B. Millet, Denham Springs, La., Livingston Par.
10/31/46	30	J. H. McAdams, Denham Springs, La., Livingston Par.
11/15/46	240	R. P. Vernon, Ruston, La., Lincoln Parish
11/18/46	240	*C. J. Perkins, Elizabeth, La., Allen Parish
1/1/47	45	Pelican State Field—Mr. Magruder, Alexandria, La., Rapides Parish
TOTAL L. S. U.	1,545	

TOTAL FALL DISTRIBUTION:

LACOMBE	260
L. S. U.	1,545
	1,805

TOTAL SPRING DISTRIBUTION, 1946	3,426
TOTAL FALL DISTRIBUTION, 1946	1,805
TOTAL QUAIL DISTRIBUTED, 1946	5,231



Quail holding pens L. S. U. Quail Hatchery.

QUAIL DISTRIBUTION—1947

SPRING DISTRIBUTION

DATE	NUMBER	DISPOSITION
LACOMBE HATCHERY		
5/8/47	30	Boyce Miller, Albany, La., Livingston Parish
5/8/47	36	Ben S. Graves, Norco, La., St. Charles Parish
5/8/47	60	W. J. Burris, Kentwood, La., Tangipahoa Parish
5/8/47	90	B. L. Cleneay, Hammond, La., Tangipahoa Parish
5/8/47	60	W. S. Hinson, Independence, La., Tangipahoa Parish
5/8/47	6	Philip Bankston, Baptist, La., Tangipahoa Parish
5/9/47	6	W. H. Richardson, Ponchatoula, La., Tangipahoa Parish
5/9/47	6	Dr. Glen T. Scott, Ponchatoula, La., Tangipahoa Parish
5/9/47	18	F. J. Lange, Ponchatoula, La., Tangipahoa Parish
5/10/47	6	Clarence Vining, Ponchatoula, La., Tangipahoa Parish
5/10/47	6	H. E. Tucker, Ponchatoula, La., Tangipahoa Parish
5/10/47	6	W. F. Wilson, Hammond, La., Tangipahoa Parish
5/10/47	6	M. H. Cooper, Ponchatoula, La., Tangipahoa Parish
5/13/47	30	E. L. Donaldson, New Orleans, La., St. Tammany Parish

QUAIL DISTRIBUTION—1947

SPRING DISTRIBUTION

DATE	NUMBER	DISPOSITION
5/13/47	30	A. K. Northrop, New Orleans, La., St. Tammany Parish
5/13/47	30	Eugene K. Garber, New Orleans, La., St. Tammany Parish
5/13/47	30	Angus Eason, New Orleans, La., St. Tammany Parish
5/13/47	36	Dudley Weaver, Covington, La., St. Tammany Parish
5/14/47	18	Robert Sandoz, Opelousas, La., St. Landry Parish
5/14/47	90	H. H. Burr, DeQuincy, La., Calcasieu Parish
5/14/47	60	Ray Iles, DeRidder, La., Beauregard Parish
5/18/47	27	S. C. Knight, Elizabeth, La., Allen Parish
TOTAL LACOMBE	687	
L. S. U. HATCHERY		
4/4/47	72	*C. J. Perkins, Elizabeth, La., Allen Parish
4/11/47	72	*R. P. Vernon, Ruston, La., Lincoln Parish
4/11/47	72	*C. P. Perkins, Elizabeth, La., Allen Parish
4/18/47	72	*R. P. Vernon, Ruston, La., Lincoln Parish
4/24/47	72	*R. P. Vernon, Ruston, La., Lincoln Parish
4/25/47	72	*C. J. Perkins, Elizabeth, La., Allen Parish
5/7/47	90	Rapides Wildlife Federation, Alexandria, La., Rapides Par.
5/7/47	36	Guy H. Alford, Columbia, La., Caldwell Parish
5/7/47	18	M. E. Doyal, Chatham, La., Jackson Parish
5/7/47	60	J. D. Koonce, Jonesboro, La., Jackson Parish
5/8/47	24	Roy D. Johnson, Bunkie, La., Avoyelles Parish
5/8/47	12	E. D. Phillips, Baton Rouge, La., East Baton Rouge Parish
5/8/47	12	Allen J. Bergeron, Baton Rouge, La., East Baton Rouge Parish
5/8/47	12	C. V. Tessier, Baton Rouge, La., East Baton Rouge Parish
5/8/47	12	O. J. Junot, Baton Rouge, La., East Baton Rouge Parish
5/9/47	24	Winston Durnin, Baton Rouge, La., East Baton Rouge Parish
5/9/47	24	G. E. Hatcher, Baton Rouge, La., East Baton Rouge Parish

QUAIL DISTRIBUTION—1947

SPRING DISTRIBUTION

DATE	NUMBER	DISPOSITION
5/9/47	30	Hon. T. H. Martin, St. Francisville, La., West Feliciana Par.
5/9/47	24	R. E. Barrow, St. Francisville, La., West Feliciana Parish
5/9/47	30	W. S. York, Sicily Island, La., Catahoula Parish
5/9/47	36	Hon. W. I. Hair, Winnsboro, La., Franklin Parish
5/9/47	18	Walter Woods, Winnsboro, La., Franklin Parish
5/9/47	60	Joe Combs, Monroe, La., Ouachita Parish
5/9/47	36	W. L. Mattison, Bastrop, La., Morehouse Parish
5/9/47	36	F. H. Schneider, Jr., Lake Providence, La., East Carroll Parish
5/9/47	48	Hon. Henry C. Sevier, Tallulah, La., Madison Parish
5/9/47	30	Hon. Lamar T. Loe, Tallulah, La., Madison Parish
5/12/47	60	Dr. Guy G. Aycock, Franklin, La., St. Mary Parish
5/12/47	60	J. E. Krauss, Lafayette, La., Lafayette Parish
5/12/47	120	E. D. Peckham, Crowley, La., Acadia Parish
5/12/47	90	C. B. Goodreau, Jennings, La., Jefferson Davis Parish
5/12/47	198	Joe Partridge, Lake Charles, La., Calcasieu Parish
5/12/47	42	Paul Baker, Lake Charles, La., Beauregard Parish
5/13/47	30	W. B. Reily, Jackson, La., East Feliciana Parish
5/14/47	180	F. E. Hernandez, Leesville, La., Vernon Parish
5/16/47	60	C. J. Bergeron, White Castle, La., Iberville Parish
5/16/47	60	R. N. Sims, Donaldsonville, La., Ascension Parish
5/16/47	60	A. J. Morgan, New Roads, La., Pointe Coupee Parish
5/16/47	24	Ovide B. LaCour, LaCour, La., Pointe Coupee Parish
5/16/47	12	G. E. Johnson, Baton Rouge, La., East Baton Rouge Parish
5/16/47	12	W. W. Tennant, Baton Rouge, La., East Baton Rouge Parish
5/16/47	12	Davis B. Durnin, Baton Rouge, La., East Baton Rouge Parish
5/16/47	12	C. G. Caillouet, Baton Rouge, La., East Baton Rouge Parish
5/18/47	9	S. C. Knight, Elizabeth, La., Allen Parish

QUAIL DISTRIBUTION—1947

SPRING DISTRIBUTION

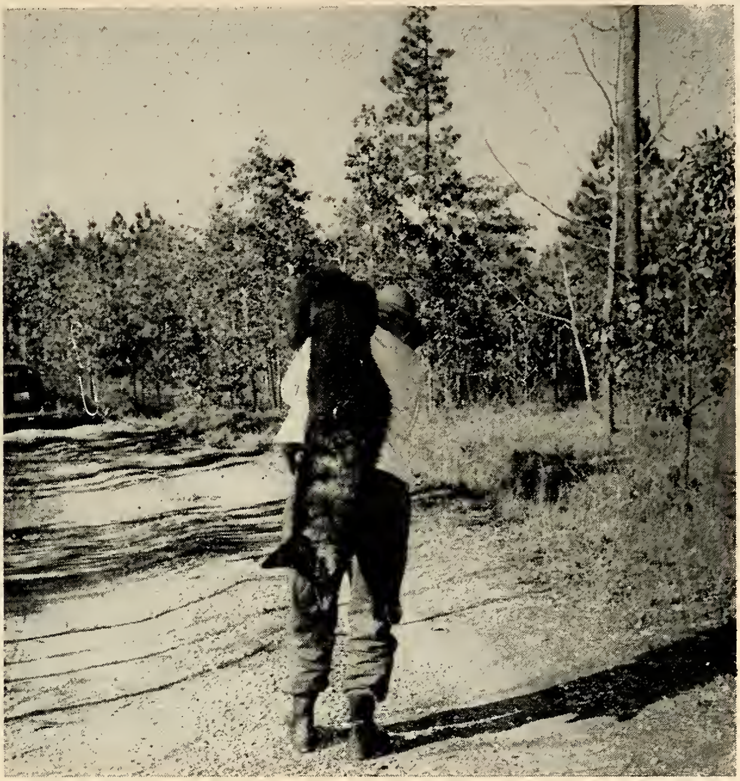
DATE	NUMBER	DISPOSITION
5/19/47	12	Claude Hamel, Shreveport, La., Caddo Parish
5/19/47	6	G. C. Strong, Shreveport, La., Caddo Parish
5/19/47	4	Earl Vaught, Shreveport, La., Caddo Parish
5/19/47	6	Virginia Williams, Shreveport, La., Caddo Parish
5/19/47	6	Alex Fiel, Shreveport, La., Caddo Parish
5/19/47	12	Chas. L. Horne, Shreveport, La., Caddo Parish
5/19/47	4	A. J. Matthews, Minden, La., Webster Parish
5/19/47	39	C. L. Beazley, Shreveport, La., Caddo Parish
5/20/47	6	S. C. Maddry, Cotton Valley, La., Webster Parish
5/20/47	3	Estelle Shaw, Minden, La., Webster Parish
5/20/47	6	E. H. Adams, Cotton Valley, La., Webster Parish
5/20/47	2	L. T. Brownley, Cotton Valley, La., Webster Parish
5/20/47	4	Lester E. Edwards, Minden, La., Webster Parish
5/20/47	6	Louis Dillon, Minden, La., Webster Parish
5/20/47	6	A. R. Almond, Minden, La., Webster Parish
5/20/47	6	J. C. Bridges, Minden, La., Webster Parish
5/20/47	4	E. V. Almond, Minden, La., Webster Parish
5/20/47	10	H. A. Haigler, Minden, La., Webster Parish
5/20/47	9	Ray Waddy, Cotton Valley, La., Webster Parish
TOTAL L. S. U.	2,296	

OPERATIONAL COST
HATCHERIES
FISCAL YEARS 1946-47 AND 1947-48

CODE	CLASSIFICATION	L. S. U. QUAIL HATCHERY		LACOMBE QUAIL HATCHERY		BEECHWOOD FISH HATCHERY		LACOMBE FISH HATCHERY		MONROE FISH HATCHERY	
		1946-47 Actual	1947-48 Estimated	1946-47 Actual	1947-48 Estimated	1946-47 Actual	1947-48 Estimated	1946-47 Actual	1947-48 Estimated	1946-47 Actual	1947-48 Estimated
101	Salaries, Continuing	$ 5,216.08	$ 6,225.00	$ 3,142.50	$ 3,300.00	$ 1,200.00	$ 1,200.00	$ 1,215.00	$ 1,410.00	$ 1,591.60	$ 1,655.50
103	Labor				75.00					3.20	42.00
204	Cleaning and Waste Removal					11.90	15.00				
208	Heat, Light, Power, Water	504.46	550.00	154.82	160.00			14.76	15.00	110.77	115.00
210	Insurance	371.80	375.00	35.28	75.00	83.84	100.00			64.07	
214	Postage	7.50	7.50			3.70	5.00				3.00
215	Freight, Drayage, Express	2.84	3.00	1.03		3.29				7.65	
220	Repairing and Servicing Property	11.65	25,00		75.00	83.28	125.00	172.56	175.00	45.65	45.00
226	Telephone and Telegraph	61.40	120.00	4.10	5.00	40.70	50.00			56.77	75.00
228	Traveling Expenses	4.95								81.75	85.00
301	Building Supplies			54.47	60.00	5.94	5.00	214.62		139.90	100.00
303	Paint Supplies					3.50	5.00			2.90	
310	Electrical Supplies							40.84			
314	Feed	2,483.58	2,800.00	638.21	900.00	429.25	450.00	321.94	325.00		
320	Fuel Supplies	18.79	35,00	6.00	10.00	60.00	60.00	2.00	25.00	15.90	80.00
322	General Plant Operating Supplies	62.86	75.00	28.98	20.00			1.37	100.00	6.87	8.00
324	Hand Tools, Minor Equipment	13.07	25.00	3.29						3.40	10.00
326	Horticultural and Farm Supplies	7.01				3.27					
332	Lab., Hosp. & Medical Supplies	.99				173.75	160.00	12.50	15.00	68.15	
336	Motor Vehicle Supplies	129.87	150.00	12.80	40.00	27.78	50.00		25.00	11.89	150.00
342	Repair Supplies, Parts for Equip.	6.18	15.00								
602	Automotive Equipment			1,129.48							
604	Building & Power Plant Equip.	357.45									
804	Buildings	6,462.50									
		$15,722.98	$10,405.50	$ 5,210.96	$ 4,720.00	$ 2,130.20	$ 2,225.00	$ 1,995.59	$ 2,090.00	$ 2,210.47	$ 2,368.50

PREDATORS KILLED—1947

Date	Parish	Skunks	Wolves	Armadillos	Foxes	Bobcats	Miscellaneous
August	Winn	6	..	19	19	1	..
September	Caldwell	2	6	6	5	2	..
October	Caldwell and Madison	3	1	..	13	3	..
November	Caldwell and Caddo	2	3	..	23	3	..
December	Caldwell, Rapides, Caddo and Natchitoches	..	5	..	22	..	..
TOTALS		13	15	25	82	9	..



Black wolf taken by predator control agent.

Wildcat in trap.

Predator Control Supervisor Joe Miller with two wildcats.

Predator Control

The Legislature of 1946 increased the hunting license fee to $2.00. The extra dollar was dedicated for specific purposes. Twenty-five per cent of these funds was dedicated for predator control.

There has been a great increase in the predators of the State. Undoubtedly, a great deal of this increase was due to war conditions which took so many men away from the farms, lack of ammunition and difficulties due to travel restrictions in certain sections of the State. The increase in our foxes brought on an epidemic of rabies and a tremendous increase in wolves and bobcats brought on a terrific loss to our ground-nesting game birds, to our mammals, particularly rabbits, and to our young deer. Due to the failure of a bounty system which has been tried for many years in practically all of the States, the Wild Life and Fisheries Department set up a predator control section of the Fish and Game Division. The U. S. Fish and Wildlife Service, Department of the Interior, was contacted and they suggested one of their trappers who was a former Louisianian to supervise this new program. Accordingly, Mr. Joe Miller, Leesville, Louisiana, was appointed the first predator control supervisor.

It has taken considerable time to get equipped. He is now assisted in the field by two trappers and already accomplished excellent work in a few sections of the State. It is hoped that this program will be increased and that in a reasonable length of time this predator control section will bring back to the proper balance the predators of the State.

MIGRATORY WATERFOWL REPORT 1941-1948

Major James Brown, Director, Fish and Game Division
Louisiana Departmment of Wild Life and Fisheries

Season	No. Days	Bag Limit	No. Clubs	No. Guns	Ducks and Geese Killed	Duck Stamps Sold in Louisiana	Hunting Licenses Sold in Louisiana	Average Kill per Gun
1941-42.....	60	10	30	6,398	48,904	45,102	146,648	7.64
1942-43.....	70	10	23	6,063	50,164	44,252	131,009	8.27
1943-44.....	70	10	25	6,992	59,075	35,199	94,609	8.45
1944-45.....	80	15	26	7,867	82,474	44,893	124,485	10.17
1945-46.....	80	10	31	10,117	80,599	57,740	163,072	7.96
1946-47.....	45	7	30	6,439	32,506	53,592	150,252	5.02
1947-48.....	30	4	25	2,803	10,619	62,376	170,396	3.78

ESTIMATED GUNS AND KILLS ON DUCKS AND GEESE FOR ENTIRE STATE

1941-42......Probable guns entire State.....225,510 Probable State Kill.....1,046,366
1942-43......Probable guns entire State.....221,260 Probable State Kill.....1,166,040
1943-44......Probable guns entire State.....175,995 Probable State Kill..... 959,193
1944-45......Probable guns entire State.....224,465 Probable State Kill.....1,609,414
1945-46......Probable guns entire State.....288,700 Probable State Kill.....1,431,952
1946-47......Probable guns entire State.....267,960 Probable State Kill..... 609,239
1947-48......Probable guns entire State.....187,128 Probable State Kill..... 145,960

KILL BY SPECIES

Specie	1941-42	1942-43	1943-44	1944-45	1945-46	1946-47	1947-48
Mallards	18,649	22,915	31,155	40,128	34,066	14,085	5,658
Pintails	9,694	11,296	10,958	12,458	15,171	4,873	800
Gadwalls	2,836	3,008	5,551	5,120	4,930	2,629	798
Widgeon	1,700	824	1,243	2,099	1,817	1,122	374
Green-winged Teal	2,016	1,782	1,156	4,810	3,645	1,866	402
Blue-winged Teal	894	924	1,537	3,269	2,949	1,507	215
Spoonbill	1,107	1,559	1,753	3,146	1,677	1,413	166
Redhead	172	296	327	187	288	106	121
Canvasback	444	956	582	261	313	103	115
Scaup or "Dos Gris"......	2,509	379	403	1,246	7,150	1,250	532
Ringneck Duck	3,081	2,864	2,341	5,102	5,590	2,461	949
Bufflehead "Butterball" ...	273	123	207	224	210	244	100
Coot	3,242	2,874	2,658	1,629	3,702	1,442	2,310
Snow Goose	266	193	105	621	365	114	16
Blue Goose	1,475	688	662	2,277	1,909	687	273
White-fronted Goose	46	58	21	129	94	7	26
Canada Goose	417	472	294	496	401	6	65
Miscellaneous	3,325	1,828	780	971	24	33	9
TOTAL	52,146	53,039	61,733	84,173	84,301	33,948	12,929

The drastic regulations, promulgated by the President of the United States on the recommendations of the U. S. Department of the Interior through its Fish and Wildlife Service, accounted for the smallest kill of migratory waterfowl since the use of modern fire arms. The statistical record of this season not only indicates the drastic regulations, but, in my opinion, would have justified a closed season.

The above figures show an increase in hunting licenses sold in Louisiana and an increase in the sale of duck stamps, despite the drastic regulations. This increased hunting load on our migratory waterfowl during the acknowledged depression in our waterfowl populations spells disaster unless we have ideal conditions in the breeding grounds this coming spring.

Louisiana experienced a very heavy concentration of migratory waterfowl commencing about the tenth of November and continuing for about a week. Our season opened on November 18 and at that time the northern part of the State and the southeast corner of the State had an excellent population of ducks and geese. However, the southwest section of the State had a very small population during the first few days of the season. The first two days of shooting pretty thoroughly dispersed the ducks over the northern part of the State and in many of the best areas of the southeast section. Up until the first of December, the ducks seemed to concentrate in fair numbers in the southwest section of the State, even extending into the central area. Bad weather and rising waters soon drove most of these concentrations back into the coastal area and, apparently, into Mexico. There were very few areas in the coastal region that carried good concentrations of ducks and geese during the remainder of the season which closed on December 17. During January and up to the first of March the spring migration of ducks from Mexico and across the Gulf have possibly indicated a slight increase over the spring migration of last year. Unfortunately, illegal hunting has been very prevalent in Louisiana during the month of February. Federal and State wardens have, in most cases, done everything within their power to stop this illegal kill, but the State of Louisiana with its vast coastal areas and the vast swamps of central and northern Louisiana have made such a task impossible. From October to April Louisiana needs more Federal wardens to assist our State wardens in minimizing the illegal killing of our migratory waterfowl.

FEDERAL AID IN WILDLIFE RESTORATION

(Pittman-Robertson)

REPORT OF PROGRESS

1946-1947

Prepared by

JOHN S. CAMPBELL

State Coordinator, Federal Aid

INTRODUCTION

In preparing this report, it was essential that a concise account be presented on each of the existing projects so as to emphasize the full value of the program. To do this, each activity under its respective heading is treated by outlining procedure and compiling data and suggestive recommendations. Adequate charts, graphs, tables, and maps have been provided to simplify the contents.

FEDERAL AID IN WILDLIFE RESTORATION

(Pittman-Robertson)

REPORT OF PROGRESS, 1946-1947

As it is a basic requirement that all Federal Aid projects be of substantial character and design, it becomes necessary that they be listed under one of the five groups as follows:

(1) Land purchase

(2) Land development

(3) Investigation and surveys

(4) Coordination

(5) Maintenance

Activities for this biennium have been confined to three of this group, namely: Land development, investigation and surveys, and coordination.

LAND DEVELOPMENT

PROJECT: 6-D, Farm Game Habitat Improvement

LEADER: Harold E. Wallace

Progress Account

Activities for this biennium have not been confined to any one of the many phases of this project; instead, much time was spent on a number of allied activities essential to a development program of this nature. These can be enumerated as follows:

(1) Selection of co-operators and distribution of seed for field border planting.

(2) Continued planting of bicolor-sericea lespedeza field borders on farms under Soil Conservation Service agreement.

(3) Expansion of the project planting program into new Soil Conservation Service Districts and work unit areas.

(4) Continued development of bicolor seed increase blocks.

(5) Summer check and inventory of bicolor-sericea stands, border protection and maintenance.

(6) Case history study of existing field borders in order to ascertain most desirable cultural methods for stand establishment and maintenance.

(7) Seasonal harvesting of seed from bicolor seed increase blocks.

(8) Initial development of a bicolor seedling nursery.

(9) Winter planting of bicolor seedlings on field borders.

Perhaps before the above-mentioned activities are discussed it would be advisable to review the previous activities of this project so as to understand what foundation has been established for its present progress.

Work on this project began in 1942 when a small amount of sericea seed was distributed to a few Soil Conservation Service work units over the State. It was in the following year, 1943, when the project received its first tremendous impetus. In that year twenty-eight parishes participated in this program and received 48,550 pounds of sericea seed. Commercial fertilizer in the quantity of 388,400 pounds was furnished to be used in the planting of this seed. This was a huge quantity of material to be furnished on such a new program, but it was well distributed and well utilized toward restoring quail habitat. In fact, 1943 can certainly be noted in Louisiana agriculture as a year in which a new crop was introduced to the farming picture—that of sericea lespedeza as a source of multiple values.

During the following three years this project operated on a very limited scale due to the critical war years when field personnel was not available. Very little unnecessary farming was done, and with food crops in such demand there was no place in the farming program for wildlife plantings. Even when the war was over it took another year for the farm program to get back into normal operation. This condition also applied to Pittman-Robertson personnel as well. So it was in 1946 before the field border program regained its normal place in the farm operation.

It was during these critical years that bicolor was recognized as a field border plant in Louisiana. Since that time (1944) bicolor has been considered by a large number of farmers as an integral part in land use planning.

The following table shows the extent of participation in the 1946 program:

Work Unit	Pounds of Seed (Bicolor)	Pounds of Seed (Sericea)	Pounds of 4-12-4 Fertilizer	Acres per Unit of Field Border
Ringgold	200	380	4,000	43.7
DeRidder	80	160	1,000	18.0
Ruston (1)	100	160	1,000	20.0
Farmerville	85	380	4,000	32.2
Winnfield	0	300	1,500	18.8
Ruston (2)	66	380	4,000	30.3
TOTAL	531	1,760	15,500	163.0

Inspection of plantings made for this season show that all work units complied with specifications or seeding methods recommended by technicians of the Soil Conservation Service and the Fish and Game Division of the Wild Life and Fisheries Department.

The following table shows the extent of participation in the 1947 program:

Work Unit	Pounds of Seed (Bicolor)	Pounds of Seed (Sericea)	Acres per Unit of Field Border
Minden	400 unclean	100 clean	41.4
Ringgold	500 unclean	100 clean	50.0
Mansfield	400 unclean	100 clean	41.4
Many	200 unclean	50 clean	20.8
Gibsland	200 unclean	50 clean	20.8
Plain Dealing	200 unclean	50 clean	20.8
Winnfield	200 unclean	50 clean	20.8
Coushatta	200 unclean	50 clean	20.8
Ruston	200 unclean	50 clean	20.8
Bernice	200 unclean	50 clean	20.8
DeRidder	200 unclean	34 clean	19.5
Natchitoches	200 unclean	60 unclean	21.7
Jena	300 unclean	170 unclean	39.2
Oak Grave	200 unclean	60 unclean	21.7
Bastrop	200 unclean	60 unclean	21.7
Farmerville	200 unclean	30 unclean	19.4
TOTAL	4,000	1,064	421.6

In 1947 for the first time there was no commercial fertilizer issued with seed. Previously fertilizer had been distributed with the seed for an application of 200 pounds per acre on all wildlife border strips planted to sericea and bicolor. As it was found in previous planting that applications of fertilizer were not needed to produce adequate stands of these plants; this practice has been definitely discontinued.

Condition of Field Borders

It is readily apparent that the drouth through the growing season for 1947 was very damaging to sericea-bicolor borders over the entire area where these plantings were made. In many localities there was no rain for a period of four months—May, June, July, and August. Under these extreme climatic conditions plant growth was inhibited to an immense degree.

A survey of drouth damage was made in early September on field borders over the northern portion of the State. Borders which had been planted in the spring of this year were in a critical condition. Eighty to ninety per cent plant mortality in stands was not uncommon. The plants which did survive were those which were partially shaded. Rain did occur in late September, and plants which managed to survive now appear to be healthy and vigorous. The majority of first-year borders will be of sparse stands and will require replanting by the use of seedlings.

Second and third-year stands of bicolor from direct-seeding are not developing as much as they normally would under favorable growing seasons. Due to the retarding of growth little to no seed was produced the past two growing seasons. However, the stands are surviving, and with normal growing seasons should produce favorable seed crops.

Seedling-planted borders are satisfactory though there are great variations in growth due to differences in soil types on various farms. The average planted border appears to be aproximately seventy per cent intact, with variation of from fifty to ninety per cent survival. Growth on the more favorable sites often averages six feet in height. These seedling-planted borders were established in January and February, 1947.

Usage of Bicolor Seedlings

The value of establishing field borders by the use of bicolor seedlings is well recognized. The farmers want a program that will produce immediate results with the minimum effort and expense for planting and maintenance. Seedling-planted borders will produce these desired results and at the same time produce a limited amount of seed the first year. Whereas, a direct-seeded border, to obtain the best results, requires some cultivation the first year and will take two years to produce a normal seed crop. In view of this fact, this program will benefit materially by using seedlings for all future border plantings whenever possible.

During the months of January and February of 1947 twenty-five borders were established by the use of bicolor seedlings. Approximately 30,000 seedlings were used in this work—seedlings provided by the Soil Conservation Service nursery at Minden, Louisiana. All plants were in excellent condition, fifteen inches in length with the ratio of crown to root about equal. Seventeen borders were established in the Ringgold unit; the remainder of the material was used in the Ruston unit.

Several methods were used in planting these bicolor seedlings. Briefly, they are as follows:

(1) *Use of horse and plow.* A furrow was opened, plants placed firmly against the side of the furrow, another furrow was thrown against the plants so as to cover roots and hold the plant in an upright position.

(2) *Use of tractor and terracing plow.* A furrow was opened, plants placed in position as mentioned in the above method. After roots of seedlings had been covered by the second furrow, the tractor operator firmly packed the plants by driving the rear wheel of the tractor as closely as possible to the row of newly-planted seedlings. This method proved superior to the horse and plow method.

(3) *Use of dibble.* An ordinary pine seedling dibble was used in this procedure. A two-man crew was employed and plants spaced at two and one-half to three-foot intervals. This method had the following advantages:

   (a) Rough borders could be planted without danger of erosion caused by the operation.

   (b) Seedlings could be placed in inconvenient areas where it would be impossible to use horse and plow or tractor.

   (c) Any spare time could be used by the farmer for planting seedlings. No time or effort was lost in rounding up the necessary equipment.

   (d) Planting could be carried on when the weather was inclement or the ground too wet to plow. This is the important advantage in that it gives the farmer an opportunity to plant a wildlife border when he is unable to carry on other farm operation.

Source of bicolor seedlings

It has already been mentioned that twenty-five borders were established with seedlings obtained from the Soil Conservation Service nursery located at Minden, Louisiana. This, of course, is only a minute quantity of seedlings, but it was the only material that was available. Other states with field border programs utilized their entire output of seedlings on plantings within their own state so that no material was available from outside sources.

It was fully realized that Louisiana should provide its own bicolor seedlings for their border plantings. With this in mind, an area for the production of seedlings was established in the Ringgold work unit. Eight acres of medium-textured fine sandy loam (Ruston soil type) were prepared and seeded the second week in April, 1947.

The Ringgold nursery was well worked and under normal conditions would have produced at least a half million plants. However, a disastrous four-month drouth occurred and a great majority of the seedlings succumbed. Great skips appeared in the rows, but plants that did survive are now in excellent condition. Perhaps 25,000 plants will be taken from this nursery for 1948 spring planting, but the exact number will not be known until the plants are dug.

The Soil Conservation Service nursery at Minden will produce approximately 70,000 plants for the 1948 season. Louisiana farms will receive a fair amount of this material. A request has been made for 35,000 plants from this source which is fifty per cent of the total production. In 1946 the State received fifty per cent of this nursery's production for the field border planting program.

Source of bicolor seed

In working with bicolor establishment and maintenance one activity which enters into the picture is that of harvesting the seed for additional plantings. In this activity a study was made of the bicolor seed increase blocks located at the Soil Conservation Service nursery near Minden. At this nursery there are two blocks, the State-cooperative block and the Soil Conservation Service block, comparable in size (approximately four acres each) and comparable in age (approximately four years old) which are adjacent to each other. This was the subject matter.

In harvesting the bicolor, the State-cooperative acreage (henceforth termed Block No. 1) was hand-topped, dried, and thrashed. The Soil Conservation Service acreage (Block No. 2) was entirely combined. An Allis-Chalmers 60 combine was used in the process. A comparison of these methods is as follows:

	Block No. 1	Block No. 2
Labor costs in harvesting	221 hrs. @ .500 29 hrs. @ .875 6 hrs. @ 1.110	11 hrs. @ .500 11 hrs. @ .875
Total Cost	$142.535	$15.125
Amount of unclean seed obtained	950 pounds	773 pounds
Cost per pound to harvest	15.0 cents	1.96 cents
Labor costs in cleaning	14.5 hrs. @ .50	15 hrs. @ .50
Total labor cost	7.25	7.50
Machinery cost	1.22	1.63
Supervision cost	1.89	3.78
Total cost of cleaning	$10.36	$12.91
Amount of clean seed obtained	584 pounds	460 pounds
Cost per pound to clean	1.77 cents	2.81 cents
Total cost per lb. to harvest and clean	26.2 cents	6.09 cents*

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* There was no charge for use of the combine. If rental had been computed the total costs for the two methods would have been only slightly different.

Louisiana has always relied on the bicolor seed increase block at Minden for a source of this material. Usually there is much trouble in collecting the seed because the plants often reach an average height of nine to ten feet. It may be added that the bicolor stems are cut back to the ground each fall, thus the ten-foot height is an annual growth. This cutting-back process also causes the plants to produce from six to twelve stems per plant. Just the seedheads are often five feet in length after being clipped from the parent stems. Difficulty is experienced in feeding them through the combine when that method is used. Thus the harvesting method presented a problem.

The cost estimates included in this report were obtained from the November '46 harvest. In 1947 an experiment was carried out on the seed increase block in an effort to solve the harvesting problem. An attempt was made to hold back extreme height growth by late clipping. Therefore, in May all plants were reclipped back to the ground. With a normal season the plants should have recovered rapidly and reached an easily handled height. However, the ensuing dry summer was not to be reckoned with, and as of October 1st the plants averaged a mere fifteen inches in height.

Adjacent to the State-co-operative block (which was experimentally clipped back twice) was the S. C. S. block which was used as a check plot. Consequently, this check block was not reclipped. Usualy this bicolor block reaches nine to ten feet in height in one growing season. However, as of October 1st, the plants averaged four feet in height with sporadic and slight blooming and very little seed production. Thus the weather not only neutralized the experiment but eliminated a seed source as well.

There is one other seed increase block in Louisiana, that is a 14-acre bicolor block located at the Lake Bruin Fish Hatchery near St. Joseph in Tensas Parish. This acreage was direct-seeded in 1945. The site is alluvial and fertile but periodically subjected to partial inundation by seepage from the nearby Mississippi River during flood stage. On the higher portions of the block bicolor growth is good. At present, there is approximately two acres of bicolor comprising a rather dense stand with a height growth of six to seven feet. Blooming has been sporadic with very little seed production noted. This block will be cut back and disked this spring, and with a normal growing season should produce a fair amount of seed this next year.

Analysis of field borders

It was mentioned earlier in this report that the sericea program was an immediate success. It took only a year or so for sericea to become established permanently in a community once it was given a trial. Then bicolor was added to the program but early plantings met with almost complete failure. The proper culture of this new plant was not known. However, it was doing well in Alabama, Georgia, North Carolina, and other southern states with similar climatic conditions and soil types. Perhaps we overlooked some planting factor here in Louisiana. With this doubt in mind we decided to initiate a study into the culture of bicolor.

Consequently, in the early part of 1946 a new project, "Field Border Investigation," (note report on 7-R) was activated to ascertain the best methods for establishing and maintaining sericea-bicolor borders. As a biologist was already engaged in the field border planting program it was decided to add this project to his activities. Consequently, much time was spent in the field making case history studies of bicolor plantings. Such factors as date of seeding, method of planting, and soil types utilized were recorded and correlated with stand success.

As the field border planting program is concerned with the culture of bicolor in producing good stands, it is felt that a presentation of these findings is not out of place in this report.

Distribution of analyzed borders

Field work was carried out on establised bicolor borders in twelve work units as follows:

Work Unit	Borders Inspected
Ringgold	14
Plain Dealing	5
Calhoun	5
Bastrop	9
Oak Grove	8
Farmerville	9
Winnfield	3
Ruston (Spencer)	5
Ruston (Barnard)	3
Jena	10
Many	8
DeRidder	13
Total	92*

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*Twelve of these borders were plowed under by farmers and were thus unavailable for study.

Degree of success of borders

An arbitrary standard for classifying bicolor borders was set up as follows:

1. Successful border—more than two stems per square yard
2. Doubtful success—one or less than two stems per square yard
3. Probable failure—less than one stem per square yard
4. Complete failure—no stems present

Using this standard of classification, the resulting tables are set forth:

Condition of stands

Work Unit	Successful	Doubtful Success	Probable Failure	Complete Failure
Ringgold	6	0	2	1
Plain Dealing	1	2	0	2
Calhoun	2	1	1	1
Bastrop	3	2	0	5
Oak Grove	1	1	0	6
Farmerville	1	0	0	5
Winnfield	0	0	1	2
Ruston (Spencer)	2	1	0	2
Ruston (Barnard)	2	0	1	0
Jena	2	5	1	2
Many	3	2	3	0
DeRidder	2	0	5	1

The above table can be consolidated as follows:

Stand Classification	No. of Plantings	Percentage of Plantings
Succesful	25	31.25
Doubtful Success	14	17.50
Probable Failure	14	17.50
Complete Failure	27	33.75
TOTALS	80	100.00

Factors affecting the culture of bicolor

A case history was made of each border visited and such factors as soil type, time of planting, method of seedbed preparation, method and time of seeding, and subsequent treatment were recorded together with the resulting stand success and condition of the border. These elementary factors are presented in separate tables for clearer conception.

Time of planting as a factor

The number of plantings made and the time at which they were made is incorporated in the following table:

Planting Date	Successful	Doubtful Success	Probable Failure	Complete Failure	Totals
February 15-28	0	0	0	1	1
March 1-15	2	0	4	3	9
March 16-31	2	0	1	0	3
April 1-15	0	1	1	1	3
April 16-30	13	6	5	3	27
May 1-15	2	3	3	0	8
May 15-31	4	3	0	2	9
June 1-15	1	1	0	0	2

The cooperators were advised to plant their borders early in the spring but this was not done, often because the seed reached them rather late or because they were busy planting their crops. This being true, the majority of plantings were made during the latter part of April and the first part of May.

Method of Seedbed preparation as a factor

The majority of the borders were prepared in a similar manner so that there was little distinction to be made. The usual method of preparation was fertilizing, disking, and seeding. Occasionally a thorough harrowing preceded the seeding. A few of the borders were dragged after seeding but none were packed properly, thus an essential procedure was omitted.

Method of sowing as a factor

All of the plantings were broadcast. The main difference was sowing on a fresh seedbed as compared with sowing on a firm seedbed. This factor is set forth in the table below.

Status	Seedbed		Per Cent		Covered	Uncovered
of Stand	Fresh	Firm	Fresh	Firm	Seedbed	
Successful	14	8	38.9	33.3	1	21
Doubtful Success	6	8	16.7	33.3	1	13
Probable Failure	10	4	27.7	16.7	1	13
Complete Failure	6	4	16.7	16.7	0	10
TOTALS ..	36	24	60.0	40.0	3	57

The cooperators were fairly well divided on sowing the bicolor on a fresh seedbed (60 per cent) or on a firm seedbed (40 per cent) yet the results were closely similar. The great majority did, however, follow the policy of leaving the seed uncovered after sowing.

Fertilizer as a factor

At least ninety per cent of the cooperators used the 4-12-4 fertilizer which was furnished them with the seed so that there is no variation in this factor for comparison. Rate of application was two hundred pounds to the acre.

Soil Type as a factor

Soils were identified and classified by reference to Soil Conservation Service maps and tables. However, the minute soil type variations are not differentiated as there is no practical value to do so in applying the results to a state-wide program. All of the soil types listed below are *fine* to *very fine sandy loams,* ranging to *silt loams* in a few examples (Oliver, Lexington).

Soil Type	Plantings Successful	Doubtful Success	Probable Failure	Complete Failure
Ruston	8	3	1	1
Shubuta	3	2	3	0
Kalmia	1	1	1	0
Cahaba	0	1	1	0
Susquehanna	2	1	0	1
Bowie	0	0	3	0
Stidham	2	0	2	1
Dougherty	1	0	0	0
Hymon	0	0	0	1
Beauregard	0	0	1	1
Cuthbert	0	1	0	0
Boswell	0	1	1	0
Tilden	2	1	0	1
Paden	0	1	0	1
Orangeburg	0	0	0	2
Leal	1	0	0	0
Oliver	1	1	0	0
Lexington	1	1	1	0
TOTALS	22	14	14	9

Many of the stands that were failures are not included in the soil type table because other factors were so apparently the influencing agencies. One such example was the lengthy and periodic overflows which inundated plantings in the Oak Grove unit.

Supervision as a factor

Perhaps the most important factor affecting good stand establishment is one which cannot be put down in table form; it is the factor of supervision. It has been observed that where supervision was present, correct planting methods were followed and good stands resulted. It is up to the biologist and S. C. S. technicians to see that this supervision is provided and that the resulting borders are properly maintained.

Conclusions and recommendations

It is believed that we are using the correct approach in obtaining a good state-wide field border program. We have a cooperative Soil Conservation Service with technicians who are interested in wildlife. The value of our program is being recognized and gradually merged with their activities. One disturbing factor was noted at the end of this past fiscal year (July 1) and that was the noticeable shifting of Soil Conservation Service personnel from one unit to another. If this movement is continued our program will suffer through lack of technician interest and their unfamiliarity of location of existing field borders. In fact much time was spent recently in showing new technicians the location of these borders so that they would be able to check on stand protection and maintenance when visiting these farms.

Now that we are developing our own seedling nurseries and seed increase blocks we should have no difficulty in obtaining material for planting. There is a good possibility of obtaining another biologist to aid in this program, and if this is done the development phase can be handled to a greater advantage in a more efficient manner.

PROJECT: 9-D, Coastal Marsh Development
LEADER: Ted O'Neil

Progress Account

This project affects three State wildlife refuges, namely: Marsh Island, State Wildlife, and Rockefeller Refuge located in Cameron and Vermilion Parishes. Species of wildlife to be benefited are waterfowls and fur bearers.

As Federal Aid Project 1-R, *Fur Resources Management Investigation,* has been completed, it is the desire of the State to apply this research in the development of the lands confined to the three above named refuges. To do this, necessary plans, specifications, and estimates should be provided; hence the purpose of this project. These plans are to be prepared and submitted in a series. They are to be in order as follows: (1) Marsh Island Refuge, (2) State Wildlife Refuge, (3) Rockefeller Refuge. These plans are being carried through the blue print stage giving complete information on the nature of the work, equipment, materials, labor, and cost.

Priority is given to development work favorable to waterfowls wherever practicable. However, muskrat management and waterfowl management in these marshes are interdependent in an intimate association. Research under Project 1-R had laid the foundation for muskrat management, and these principles are to be fully applied in plans for development in these areas.

Federal Aid requested participation only in the planning and supervisory work of this project. The cost of development is to be borne wholly by the State out of the fur income from these refuge areas. These receipts are estimated to be from $100,000 to $150,000 annually. However, it is suggested that all of the work, planning, and development be considered an integral part of the project.

As the individual development jobs are planned, these plans are being submitted as supplements to the project.

Plan of Work

In order to initiate this project it is necessary that a work plan be provided. The plan is arranged as follows:

1. *Waterfowl Food Planting*

   Map areas to be developed. Locate sources of planting stock. Indicate planting time required, conditions at planting time, equipment, labor, costs, etc., dam control, tide action, wave barriers in impounded areas.

2. *Beach Improvement*

   Levee construction eight miles long, parallel to Gulf Shore beach and two miles north of beach. Provide impounded areas between beach and levee. Protect main muskrat marsh against hurricane damage. Further boat travel by furnishing canals and also reservoirs to hold water during drouth. Equipment, materials, labor cost, etc.

3. *Trapping Lots*

   Divide 'rat marsh into 200-acre trapping lots. Stake out marsh and show lots on large scale map. Each trapper to be allotted the same lots year after year to encourage better marsh maintenance by trappers.

4. *Crevey Drainage*

   Locate large creveys on 'rat eat-outs that can be drained. Locate shortest drainage routes. Map crevey and ditch locations. A system of management of fur trapping on Marsh Island will be recommended as a result of this program.

A general review of previous studies on Marsh Island and State Wildlife Refuges was made during the early months of this biennium. This study includes the effective changes in marsh and water bottoms in the Vermilion and Intra Coastal areas brought about by the recently constructed Atchafalaya spillway.

Both Marsh Island and State Wildlife Refuges were found to be notoriously in need of adequate waterfowl food plants. Red-sands from the Atchafalaya spillway have been deposited to a depth of one to two feet in the Marsh Island area, destroying principal food sources for wintering birds. The greatest damage is confined to the east of the Island near the mouth of the spillway, decreasing toward the Southwest Pass.

To improve and further develop the habitats of the State's Gulf Coast Wildlife Refuges, investigations are proceeding. In compliance to the above proposed work plan, completed investigations, plans for improvement, and estimated cost are as follows:

MARSH ISLAND AND STATE WILDLIFE REFUGES
(Sequences one and two)

1. Waterfowl Food Planting

Waterfowl food planting in the Gulf Coast marshes has been on the larger part, an unfruitful undertaking. The meager amount of success thus far has only been encouraging enough to cause one to believe that under certain sets of marsh and pond conditions success may be obtained—that is, provided planting is done in the late spring and early summer while the plants being used still contain the vigor necessary for reaching maturity.

It is a biological fact that every Gulf Coast marsh plant as well as many other species have had ample opportunity to become established many times on every part of the marsh area including the ponds and lakes; but no species has become established except when a perfect situation applicable to the growth and development of that particular plant is at hand.

There is practically every type of aquatic habitat known within the sphere of brackish marshes on both Marsh Island and State Wildlife Refuges, yet the number of ponds and lakes containing waterfowl food plants in satisfactory quantity is negligible. No doubt, during the past, waterfowl food plants were abundant throughout this area, but they existed under slightly different conditions than which are now present. It is known that the salt water storms of 1915-1918 and the drouth of 1924-1925 created marsh and pond conditions much too saline for any of our waterfowl food plants. It is entirely possible that these three periods of extreme salinity even destroyed the viable propagules of such plants, leaving the area practically barren since that period.

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It is a known fact that transplanting will shorten such periods of certain plant absences, provided the conditions have returned more toward normalcy. Some indication of this resulted from the experimental planting work done in

1942 on Project 1-R. The conditions of ponds and lakes at that time were not as suitable as those found today. Extreme muskrat population completely denuded the brackish three-cornered grass areas, which resulted in the pollution of ponds by rotten, hot, and discolored waters. This destroyed not only the delicate submergent plants, but also depleted the stronger emergent varieties. Old trappers have stated that a similar muskrat eatout occurred in 1922-23-24 just prior to a great drouth.

There is one other major factor aiding the present sterility of the ponds of these refuges and that is the fluctuation of tide levels and also salinities. Since 1940, the excessive salinities have been considerably reduced due to excessive rainfall and other agencies discussed below.

If it had not been for some important changes in the Vermilion Bay area habitat in the past 20 years, we could sum up this entire project in a few simple sentences, this being: The edaphic conditions that have existed for the past 30 years have depleted the waterfowl food supply on these refuges and managed to prevent their natural return. This being the case, what chance would mechanical efforts have against the natural forces that so thoroughly have taken aquatics out of these thousands of acres of impounded areas. Recent changes in these areas give promise that a great number of investigated ponds, if stocked with young, growing, adult plants, will return to productivity. The changes referred to are as follows:

1. The construction of the Intracoastal Canal has dominated the flow of fresh water drainage of the Mermentau basin so completely that the mouth of the river has silted over, pouring the bulk of the load into Vermilion Bay.

2. The spillways of the Mississippi and Atchafalaya have actually loaded the Cote Blanch and Vermilion Bay areas with fresh water and fine river sand. Whether this red sand will produce waterfowl food plant habitat remains to be seen. Surely the turbidity will not help, but during quiet weather celery (*Vallisneria*) should take hold on such a bottom,

preparing it for other aquatics. Sandy bottom is more desirable for plant growth than the former decaying peaty ooze of the original pond.

The above mentioned facts have certainly altered the salinity of Marsh Island and State Wildlife Refuges and have probably had slight effect upon the abruptness of the tide action.

It is believed that annual spring plantings over a period of five years will bring about some lasting improvements to the refuges.

Both Marsh Island and State Wildlife Refuges have been mapped showing ponds and lakes to be planted with food plants. Locations of source food plants are also shown on this map. This map has been submitted to the Department.

The following outline shows an itemized account of estimated cost and expenses of a proposed food planting program on the above named Refuges:

Costs and Expenses for Annual Treatment

(a) PERSONNEL AND WAGES:

Refuge Personnel	Duties	Period
Warren Jefferson	Assist with boat and field work and transportation of crew	20 days
Abard Stout	"	Duration
Ace LeBlanc	"	Duration
Ted O'Neil, P-R	"	20 days
Malon White, P-R	"	20 days

Labor	Number	Period	Rate	Total
Laborers	8	25 days	$5.00	$1,000.00

(b) SUBSISTENCE:

Labor	Number	Period	Rate	Total
Laborers	8	25 days	$2.00	$400.00

(c) EQUIPMENT:

Equipment owned by Refuge Personnel and Fish and Game Division:

Two (2) Lugger type boats, equipped to sleep and feed 6 men each.

Two (2) speed boats owned by Enforcement Division.

State Wildlife Refuge Headquarters camp and equipment at Fearman Bayou.

Marsh Island Headquarters and equipment at Bird Island Bayou.

Equipment to be purchased and approximate costs:

Type	Number	Unit Cost	Total
5 HP Johnson outboard motor	2	$130.00	$260.00
Skiffs, 16′ cypress	4	60.00	240.00
Pirogues, 16′ cypress	4	30.00	120.00
Potato rakes, 6 prong close teeth	6	2.50	15.00
Shovel	6	2.50	15.00
Sledge Hammer, 16 lb.	2	1.00	2.00
Trappers' Pack Sacks	6	6.50	39.00
Paddles	8	2.50	20.00
Push Poles	8	2.00	16.00
Gas Cans and Spouts	2	2.00	4.00
			$731.00

(d) OPERATION OF EQUIPMENT:

Type	Unit	Estimated Days	Unit Cost (Estimated)	Total
Lugger	2	25	$3.00	$150.00
Outboard Motor	2	25	1.50	75.00
				$225.00

(e) CONSTRUCTION OF WATER CONTROL DAMS:

Type	Number	Unit Cost	Total
Creosote Pine Lumber and Earthen Fill	4	$250.00	$1,000.00
(a) Personnel and Wages			1,000.00
(b) Subsistence			400.00
(c) Equipment			731.00
(d) Operation of Equipment			225.00
(e) Construction of Water Control Dams			1,000.00
Total			$3,356.00

Total for 1948	$ 3,356.00
Total for five years	16,780.00

Waterfowl Food Planting Work Done

The first year's work, Part A, of this Project has been carried out by the State Refuge Division. Approximately 4,000 pounds of bushy pondweed (*Najas guadalupensis*), graydock moss (*Potemogeton foliosus*), widgeon grass (*Ruppia maritima*) and coontail (*Ceratophyllum demersum*), and 5,000 celery (*Vallisneria spiralis*) plants and 35,000 banana waterlily (*Castalia flava* or *nuphar*) plants were collected and planted on Marsh Island and State Wildlife Refuges during the month of June, 1947.

Perfect pond conditions were at hand and results obtained surprised those who have been unsuccessful in this type of work on the State Refuges. However, the actual survival, spread, and permanency of the banana lily and celery cannot be determined until late spring or early summer of 1948.

Ponds that were planted received more than experimental quantities; some were "packed" with these plants, so all that they will have to do is survive and reproduce.

2. *Beach Improvement*

Marsh Island now possesses a great number of ponds, lakes and wide bayous. Approximately one-eighth of the total 86,000 acres of the Island is taken up by open water.

It is now proposed that a large portion of Marsh Island, the presently valueless south beach area, be improved for wintering waterfowl, geese, and shore-birds. The improvement of this area is dependent upon the control of water levels. To control and manipulate water levels upon this beach marsh, the construction of a levee, as outlined on a map submitted to the Department, is recommended.

It is estimated that the spoils taken from a 20′x6′ moat deposited on the south bank will be ample to trap the water from the gradual sloping beach. Cement or creosote pine water control structures 8′ wide are to be built in at two mile intervals along this levee.

Management of the Impounded Area

The crest of the levee will be planted with salt cedars. The entire new levee will be sown with wild millet (*Echinochloa spp.*). The water control gates will be left open for the first year, allowing the levee ample time to settle and become compact. At the end of the first year, the root systems of the introduced plants and others, will have bound the loose soil.

This levee construction should be started just after the storm season (October) and completion reached as soon as possible. This will allow eight or nine months for settling before the next fall equinox. Marsh grasses within this impoundment should receive fire protection for the first year and then burned during the first dry period the following July or August. As soon as possible after this dry burn, the water control gates should be closed. If this is fruitless, the first storm tide that occurs after the burn should be trapped by opening the control gates and letting the water enter through the marshes lying on the Vermilion Bay or north side. This treatment will tend to drown out the undesirable species such as (*Spartina patens*), hog cane (*Spartina cynosuroides*), *and salt grass* (*Distichlis spicata*), creating what is known as a scalded marsh. This water should be held in the impoundment until late the following spring or early summer. In other words, this water should be left on the marsh practically one year. In the month of May, just before this water is drained off, the area will be sown with wild millet (*Echinochloa crusgalli*) and some red rice (*Oryza spp.*) if the salinities permit. Red rice and millet can be collected throughout the lower rice belt during the thrashing season in August and September of the year before planting.

Aside from the introduced plants, this scalding will tend to develop the coco grass (*Scirpus robustus*) and three-cornered grass (*Scirpus olneyi*), which is at present only represented by small scattered colonies.

The scalds will produce great quantities of gray duck moss (*Potomogeton foliosus*), as transplanted gray duck moss readily takes in scalds of this type.

The shallow ponds that are now within the area are susceptible to drying-out during normal dry spells in the summer time, destroying their value as waterfowl feeding grounds. This will not occur after the levee and control gates are in operation. These ponds will then be able to produce a number of valuable plants such as banana water-lily (*Castalia flava*), gray duck moss, widgeon grass (*Ruppia maritima*), southern najas (*Najas guadalupensis*) and possibly some of the submerged forms of the (*Sagittarias*). Also try sago pondweed (*Potomogeton pectinatus*) in this area.

The control gates to this area should be left open until the early part of October. As soon as the desired species, millet, red rice, coco and three-cornered grass have reached maturity, this area should again be flooded, which will be about the early part of October.

During the storm season, latter part of September, water should again be trapped behind this levee, creating waterfowl and goose habitat.

Plus water levels should be held over this area until the following June, at which time control gates will again be opened, allowing the desired species to develop for the following winter's seed crop.

Other Benefits Derived from this Levee Construction

Occasionally Marsh Island is swept by tidal waves during severe hurricanes, playing havoc with all the fur bearers and wild life. This levee will serve as a wave-breaker, giving added protection against such storm tides. The high 6′ to 10′ beach along the Cheniere LaCroix area serves as the original buffer against tidal waves. After such a long sweep the winds will create waves over the Island, washing out 'rat beds, waterfowl and bird nests and playing havoc with the deer population. Such a levee would tend to break the wave action and also give a high refuge area during such storm periods.

The moat created by the levee construction is not cut into tide action except at one small clay bottom bayou which is the extremity of Bayou Chene and in this bayou will be constructed a water control sill, preventing any abnormal drainage, even during extreme low tides and drouth periods. This moat will hold at all times a great volume of practically fresh water which will supply the fur bearers and wild life through a period of extreme drought, such as occurred during 1925-26, which was disastrous to practically all of the living mammals and reptiles on Marsh Island. This moat will also be of great value for patrolling and also sightseeing purposes. The interested parties of the various organizations of the State and Government have long since complained that they have never been able to see anything on Marsh Island or to get the complete gist of the area, and this moat will give such persons an opportunity to work and observe in what will be the richest part of the Refuge. The moat will make accessible a part of the marsh that has heretofore been greatly neglected due to inacessibility. Even during extreme 'rat populations the entire area bordering this proposed levee was hardly trapped. The greatly increased production of *Scirpus olneyi* and *robustus* will naturally increase the value of this sea-rim area in the production of fur bearers.

The shrubs on the crest of the levee will afford perfect nesting protection for smaller birds.

Aquatic animal life, small crustacea and snails will also be abundant in these ponds after water levels are maintained. These will make the ponds much more attractive to diving ducks and the puddlers.

This type management is not altogether experimental! Such an area has been impounded in the same manner as the above described by Lutcher-Stark on their Joyce Tract at Holly Beach, Cameron Parish. Mr. Stark has no control gates in his levee which has raised the water level in the marshes, first creating excellent waterfowl and shore-bird habitat, but due to the constancy of the deeper water level, Mr. Stark's area is being gradually taken over by the valueless deep marsh species of vegetation such as cattail (*Typha spp.*) and bullwhip (*Scirpus californicus*). The latter is not necessarily valueless to waterfowl, however, reduces the open water of the area. The roseau cane (*Phragmites communis*) that originally was on the marsh is not being reduced by the deeper water levels as this species is tolerant to 12″ to 18″ of water, provided no hot burns occur. One great advantage afforded us by the water control gates is that they will give us opportunity to make dry hot burns at any time desired and then reflood, a treatment that none of the deeper marsh or climax species can endure.

The reason the cost of this proposed project is not being submitted here is due to the difficulty encountered with the marsh buggy breaking down. It is necessary that a licensed engineer inspect this project from an engineer's viewpoint and in order for him to make this survey properly he must go over the entire area in a marsh buggy. Immediately following this survey, the estimated cost will be submitted.

It is agreed that the Refuge Division will find it much cheaper to purchase a small dragline and employ an operator of their own for this project. A great deal of other work can be done with the dragline from time to time, and the Refuge Division has enough work ahead of them to justify the purchase.

3. *Trapping Lots*

These recommendations apply to State Refuges, Marsh Island and State Wildlife:

The only possible method of handling large marsh areas without a tremendous overhead and a very clumsy organization, is by employing the Camp Manager System. The camp manager's proposition must be made attractive enough to draw the highest type of personnel.

Camp Manager's Allotted Areas

Each camp manager should be allotted an area large enough to support five trappers during periods of normal muskrat populations, which would range from 1,000 to 1,500 acres to each camp in the better marshes, and possibly twice this much on the less productive type marshes.

Once an area is allotted a camp manager, it cannot be changed. In other words, he cannot be moving about from lot to lot, and he should not be removed from his position unless he has committed irregularties or shown a definite incapability to manage his camp.

The manager's duties are much the same as those of leasee who is managing a piece of marsh on a percentage basis, 35% going to the State and 65% to the manager. The manager selects his own trappers who receive not less than 50% of the value received for the fur.

I. *The Duties and Responsibilities of the Camp Managers*

1. He is responsible only to the Refuge Supervisor.

2. He selects his own trappers and assigns their lots according to their abilities.

3. He is responsible for the management of his marshes, which responsibility includes burning, patrolling, waterfowl food planting throughout the summer, ditching, damming, etc.

4. He is responsible for the care of the fur.

5. The picking up and delivery of the fur to a State Headquarters camp such as Bird Island Camp on Marsh Island and Fearman, State Wildlife.

6. He will be expected to furnish his own boat, pirogues and other necessary equipment.

7. He is responsible for the posting of his area which borders the outside of the Refuge.

II. *The Duties of the Trapper*

1. The trapper has no direct responsibility to anyone but the camp manager.
2. The trapper will receive 50% of the value of his fur catch.
3. He is expected to furnish his own traps, groceries, pirogues and other necessary gear.
4. He is expected to report to the camp manager for work in the marsh during off-seasons if he expects to continue trapping on his lot.
5. He is expected to take excellent care of his fur and to run his traps daily; for not doing this he is subject to dismissal by the camp manager.

III. *The Responsibility of the Supervisor*

1. The Supervisor is responsible for the activity of the camp manager.
2. He is the inspector of the entire Refuge area activities.
3. He sees that the fur is brought into the collecting center and transferred from there safely to the State's Fur House.
4. The Supervisor sees that the fur is counted in front of the camp manager and that he receives a receipt for such.
5. The Supervisor is also the inspector of the off-season work that the manager and his trappers do on their marshes.

IV. *Irregularities by which Managers can be Dismissed*

1. Allowing "bootlegging" of State fur.
2. Not abiding by the rules and regulations of the State and Refuge Divisions.
3. Not sufficiently trapping the excessive animals off his marshes and allowing "eat-outs."
4. Letting his trappers be sloven and careless in taking care of his pelts.

5. Not seeing that the trappers run their traps daily.
6. Failing to patrol or do necessary management work on his area during the off-season.
7. He may be removed from his post if he has an antagonistic attitude and cannot get along with his fellow workers.

In operating this camp manager system, the State will only be responsible for some 30 to 35 camp managers, whereas they are now responsible for 165 individual trappers, plus the outside interference. The State now spends a large part of its 35% on wardens' salaries, repair and maintenance of camps, ditching crews and other miscellaneous expenditures, whereas under this system, the camp managers will absorb the bulk of this expense.

Each spring after the trapping season the marshes should be examined by a competent biologist and a report made on each area.

The headquarters for the State refuges should eventually be located at Intracoastal City. A fur house, boat slips, storage house for various equipment could operate from this centrally located point. The fur sales should be held at Intracoastal City since telephones and electricity are now in the process of construction, and the highway will eventually be blacktopped.

4. *Crevey Drainage*

At the outset of this project, July 1, 1946, surveying and mapping became the major operation and continued through the first phases of the work. Maps have been made and submitted to the Department outlining the importance of creveys, or muskrat eat-outs, existing on Marsh Island and State Wildlife Refuges. At the time these maps were made these areas were in a state of complete eat-out. Due to the efforts and progress of the Refuge Division on their crevey drainage program, the larger part of these areas have recovered, or are in a state of rapid recovery.

From the circumstances mentioned above, it would be of no value to outline an additional crevey drainage program; hence, this part of our program has been omitted.

ROCKEFELLER REFUGE

(Sequence Three)

A five-year proposed project for the improvement of Rockefeller Refuge has been prepared and submitted to the Department along with a specially prepared map of the area. This map shows proper legends describing various treatments to be applied in the proposed management program.

The proposed project is as follows:

Description of the Area

Rockefeller Refuge is the largest area of its type on the Gulf Coast. This area is made up of three distinct types of marsh paralleling Grand Cheniere Ridge and abandoned sea-rim on the north and the very low rapidly leaching sea-rim on the south. The three distinct marsh types exist on the entire 20-mile length of the Refuge. They are as follows:

1. The first type, or sea-rim marsh, averages about one mile in width and is made up of highly saline marine deposits, being subject to inundation by any storm tides. Vegetative make-up on the sea-rim marshes is primarily salt grass (*Distichilis spicata*), wiregrass (*Spartina patons*), oystergrass (*Spartina alterniflora*), hog cane (*Spartina cynosuroides*) and black rush (*Juncus roemerianus*).

Management on this particular area is not recommended except for late fall burning which favors and attracts some blue and snow geese.

2. The next strip of marsh encountered, lying north of the sea-rim, is the strong brackish or coco (*Scirpus robustus*) marshes, averaging approximately two and one-half miles in width, subject to excessive salinities and some marine deposits. Coco or leafy three-cornered grass produces the most valuable all-around wildlife and fur animal habitat in the Gulf Coast marshes. The seeds, roots, and tubers are eaten by ducks. The roots, tubers and tender new growths are relished by geese and muskrats.

Coco, like bayoneted three-cornered grass (*Scirpus olneyi*), is a sub-climax species and can only be produced by removing climax roughs at the proper time of the year and while proper marsh conditions exist. Therefore, management of this type of marsh is highly important.

3. The most northerly tier of marsh bordered by Grand Cheniere Ridge on the north is the deep, poorly drained, fresh to slightly brackish marsh, averaging approximately one and one-half miles in width. Vegetative make-up is primarily an intermixture of cattail (*Typha spp.*), yellow cutgrass (*Zizaniopsis malicia*), bullwhip (*Scirpus californicus* and *validus*), roseau cane (*Phragmites communis*) and sawgrass (*Cladium jamaicense*).

This area is rated low as a wild life habitat, but lends itself well to management and development.

Ponds and Bays

The ponds and bays near the sea-rim and those nearer Gulf tides are highly saline during the greater part of the year. The bottoms are of soupy, saline mud, producing no waterfowl food plants but making excellent resting and feeding grounds for shorebirds and diving ducks. Management is not recommended for such areas.

Ponds cut off from strong tide action in the center strip of the Refuge produce an abundance of duck food during normal years, primarily gray duck moss and widgeon grass. These ponds completely cut off from tide action are suitable for banana waterlily. Management is recommended for this area.

The upper tier of marsh is practically absent of older ponds; however, drowned-out areas and areas flattened by marsh buggies, exist for two to three years, producing excellent feeding grounds for the puddle ducks.

1. *Waterfowl, Muskrat and Goose Food Planting*

(a) Waterfowl Food Planting

Previous experimental waterfowl food planting has proven that the Price Lakes are most suitable lakes and ponds on the Refuge for this type of improvement. These lakes are located on the extreme western end of the Refuge. The first year's work shall consist of heavily planting these lakes to banana waterlily and sago pondweed for the purpose of establishing planting stock to draw from the following years for other ponds. Planting should be done in late May and early June.

SUGGESTIVE WORK SCHEDULE

May 25	Six man crew leave Intracoastal City, travel to State Wildlife Refuge, collect banana waterlily at Lake Fearman.
May 26	Continue same, return to Intracoastal, 5 P. M., load collection in 1½ ton truck, travel to Grand Cheniere.
May 27	5 A. M., travel to Price Lake via mud boats and loaded flats, plant lakes.
May 28	Travel to Mud Lake at Holly Beach, 6 man crew 1½ ton truck and pirogues. Collect sago pondweed, return to Grand Cheniere.
May 29	5 A. M., travel to Price Lakes with loaded flats and plant as directed during the 1946-47 work. Make sure that the roots of the pondweeds are secured in the lake bottoms. Return to Abbeville with truck.
May 31	Travel to State Wildlife Refuge, collect banana waterlily.
June 1	Continue same, return to Intracoastal and Grand Cheniere.
June 2	5 A. M., travel to Price Lake and plant lilies.
June 3	Travel to Mud Lake, Holly Beach, collect sago pondweed, return to Grand Cheniere.
June 4	Travel to Price Lake and plant, return to Abbeville.
June 7	Travel to Intracoastal and State Wildlife Refuge, collect banana waterlily.
June 8	Continue collecting, load truck at Intracoastal, return to Grand Cheniere.
June 9	5 A. M., travel to Price Lake and plant, return to headquarters.

(b) Muskrat and Goose Food Planting
Estimated annual cost: $2,733.00

Experimental plantings by sodding of three-cornered grass (*Scirpus olneyi*) have shown great promise on the northern half of the Rockefeller Refuge.

Necessary Equipment

1. *Collecting Unit*

   One marsh buggy for collecting, pulling a small middle-buster-plow and two skiffs, a four man crew for chopping and loading the skiffs with sods.

2. *Planting Unit*

   Another marsh buggy for planting, equipped with one extended digging lug on each back wheel for gouging out a suitable hole in the marsh. This buggy drags two skiffs loaded with sods and a man riding each skiff, sodding-in as the buggy moves along.

Schedule—Time: Early June

Sod collecting buggy and crew travel to southwest shore of Deep Lake, collect sods, fill two skiffs. Return to planting buggy, leaving two empty skiffs for continued collecting. Continue planting areas as outlined on accompanying map. Estimated time of completion—30 days. Collect three-cornered grass at Muskrat Bayou when working on the east half of the Refuge.

2. *Trapping Management of Refuge*

Set up Camp Manager System with headquarters at Intracoastal City as outlined and recommended for both Marsh Island and State Wildlife Refuges in Management Program. The Refuge is to be divided into eight designated areas or lots. The total number of trappers to be employed annually—providing it is a normal fur-producing year—is thirty-eight. The total annual fur take is estimated as follows:

Muskrats	69,000
Mink	1,750
Raccoon	2,050

Each lot as outlined on map submitted to the Department will be supervised by a Camp Manager.

I. *Camp Manager's Qualifications*

He must be experienced in managing trappers and large tracts of marshland. The manager must have a past record of honesty and be highly recommended by his previous employers.

II. *Camp Manager's Duties*

He must manage his marshes in a manner making them most attractive to waterfowl and fur bearers, complying with the standards set up by the Department of Wild Life and Fisheries. He is responsible for the activities of those men working under him and responsible only to the Supervisor of the marshes. He shall act as warden over his allotted area, furnish all of his own equipment except the camps that may now exist on the lots. The expenses or upkeep of such camps and equipment shall be defrayed by him.

He shall be responsible for the delivery of his fur to the State Fur House at Intracoastal City.

After the five years' Waterfowl, Goose and Muskrat Food Planting Programs have been completed by the Department of Wild Life and Fisheries, it is the duty of the Camp Manager to continue similar work at his own expense.

III. *Proposition Offered Camp Manager by State*

A five-year contract with an option of continuing indefinitely provided his work meets with the specifications outlined by the Department in his contract.

He shall receive 65% of the value of the furs trapped on his allotted area. Of this 65%, no trapper under his supervision must trap for less than 50% of the gross amount received for the fur.

3. *Estimated Fur Catch Per Lot, Average Seasons*

	Lots	No. Men	Muskrats	Mink	Raccoon
	1	4	8,000	60	150
	2	3	6,000	90	200
	3	6	12,000	200	300
	4	5	9,000	250	300
	5	7	10,000	500	400
	6	4	6,000	250	300
	7	6	12,000	200	200
	8	3	6,000	200	200
Totals:	8	38	69,000	750	2,050

4. *Estimated Annual Cost of Project*

Waterfowl Food Planting

Refuge and P-R Personnel	
Six Laborers @ $5.00 per day—13 days	$390.00
Subsistence @ 3.00 per day—13 days	234.00
Equipment—1 State-owned 1½ ton truck @ 10c per mile—1,312 mi.	113.20
6 skiffs—State-owned	
2 outboard—10 hours each	10.00
3 mud boats—State-owned	
Total 1948	$765.20

Goose and Muskrat Food Plantings

Refuge and P-R Personnel	
Two marsh buggies and drivers @ $40.00 per day—30 days	$1,200.00
Operation of buggies, 10 gal. gas, 2 qts. oil per day, 30 days	93.00
6 skiffs—State-owned	
3 mud-boats—State-owned	
Six Laborers @ $5.00 per day—30 days	900.00
Subsistence @ $3.00 per day—30 days	540.00
	$2,733.00
1948 Total for Two Projects	$3,498.00
Total for Five Years' Work	$17,490.00

INVESTIGATION AND SURVEYS

PROJECT: 2-R, Behavior and Survival of Pen Reared Quail
LEADERS: Carroll J. Perkins and Rowland P. Vernon

Progress Account

In 1941 a three-year project was initiated in the State to determine some of the major factors influencing the present population trends of bobwhite quail, namely: habitat conditions, hunting pressure, predation, and influence of weather relative to breeding seasons. Attempts were also made to determine the practical aspects of restocking depleted areas with pen reared quail. This Project (2-R) was terminated April 30, 1944, and a final report of the findings was made to the Department.

This project was renewed July 1, 1944, for three years more, for the purpose of intensifying further investigation on survival of released pen reared quail. It terminated June 30, 1947. The first half of the work is reported in the First Biennial Report of the Department of Wild Life and Fisheries, 1944-45, pages 95-137.

The extent of this report is confined to the final analysis of the project, omitting general methods and procedures which is given in the previous report mentioned above.

The final analysis of this project may be summarized under the following heads:

1. Behavior.
2. Feeding Habits.
3. Ability to Fly.
4. Range from Release Points.
5. Orientation to Natural Habitat.
6. Fusing with Native Coveys.
7. Mating.
8. Tendencies to Maintain Domestic Traits.
9. Predation.
10. Weather.
11. Suitability of Release Points.
12. Toll Taken by Hunters.
13. Final Survival.
14. Recommendations.

1. *Behavior.*

After a satisfactory escape opening was made in the transporting crate, it was placed in a favorable position—preferably adjacent to ample cover—for the birds to escape. Observations were made at close range by technicians to ascertain behavior of birds. On placing the crate in position for escape the birds remained motionless for the first five or ten minutes. In some instances they remained motionless for thirty to forty minutes.

When the birds finally broke their silence, a hen bird was usually the first to emerge from the crate with extreme caution. After emerging from the crate much precaution was taken in moving about the crate. Suddenly, this silence was broken in the crate, and the entire covey began to file noiselessly out of the crate and walked off picking at various objects as though in search of food.

Regardless of what precaution was taken about five per cent of the covey flew upon their escape from the crate. These birds usually flew twenty to thirty yards away, either settling down to the ground or alighting in nearby trees. They immediately began whistling upon alighting.

By observing the released birds with binoculars it was found that immediately after release they show no preference of food. The peck and apparently try to eat anything within reach that resembles objects of food.

2. *Feeding Habits.* (Note graphs 1 and 2 for reference on areas.

Released pen reared quail have difficulty in finding proper food in the proper quantities unless they have the good fortune of finding native coveys with which to fuse. In one instance following the 1946 fall release on Experimental Area C-1, three released coveys, twenty birds each, got together and formed a large covey of approximately sixty birds. These birds congregated on a broad hillside which had adequate food and cover and promise of a high percentage of survivals. At this location it was possible to trap a number of these birds over a period of sixty days. In comparing weights at the time of release with those at the time trapped, it was revealed that these birds continued to lose weight and show physical weakness. During this period the size of the covey continued to diminish, and in a short time after trapping season ended in May it was realized that not a single bird survived, regardless of the abundance of native food.

Data obtained by trapping and weighing on other experimental areas also revealed, in most cases, continued loss in weight from the time of release until the time they were trapped. Released birds showed more evidence of increased weight where they joined with native wild coveys. This was found to be true both in spring and fall releases. Many of the released coveys joined wild coveys in part; in a few instances the entire covey joined with a wild covey. In cases where released birds had joined wild coveys a check on weights invariably showed a gain in weight from the time of release. In comparing the physical conditions of released quail not associated with wild coveys with those which were, it is evident that native quail aid pen reared quail in finding and selecting proper food. Also observations proved that native quail aid released quail in forming habits of self-preservation.

3. *Ability to Fly.*

It was thought that one of the major factors causing a high mortality in released pen reared quail was their inability to make a strong flight. Field observations revealed that the flight of released quail when flushed was generally less than thirty yards; although in rare instances some individuals flew considerably greater distances.

Further observations indicated that ability to make normal flights was greatly determined by whether the pen reared birds had fused with native wild coveys. In every case where released birds did not join native coveys they could be readily identified by their short erratic flight; their inability to fly was in evidence from two to three months after release. They showed little fear of dogs as they walked casually around feeding and preening when the dogs were on a point from eight to ten feet away. When flushed by dashing abruptly into the covey, they lacked the usual strong wing-beat sound made by native quail. Immediately at the end of this short erratic flight they began to make calls for reassembling the covey.

In cases where released quail joined native wild coveys it was four to six weeks before they developed the ability to make normal flights with the wild birds. Though the flight was greatly improved, they could be easily identified by the chirping sound while in flight; upon alighting they immediately began the usual calls for reassembling the covey.

4. *Range from Release Point.*

Data collected on distances traveled in a given time from point of release showed a rather wide variation. Birds released in the fall which did not join native coveys did not travel any great distance from the release point. One quarter to one-half mile was the average extent of travel. On the other hand, birds released in spring were recorded to have traveled a much greater distance. Travel was as much as five miles from point of release in the same period of time. Long distances of travel of spring released birds are attributed to their mating instincts.

5. *Orientation to Natural Habitat.*

As previously stated, pen reared quail orient themselves to natural habitat best when they are able to join with wild birds. This point was forcefully proven on a number of the release sites where releases were made in the presence of abundant food and cover, but where previous censuses showed no wild birds present. Here the survival was very poor.

In many instances released quail were found to range extreme distances from cover into the open fields. This lack of natural instinct for self-preservation caused them to easily fall prey to predatories. A high per cent of these birds did not survive for this reason.

Other ways in which the behavior of released quail differ from that of native quail are as follows:

(1) Manner in which they feed: While native quail usually begin feeding away from the roost at dawn, spend the midday under cover, and feed out to the open

fields to roost; released quail reverse this procedure in most cases. They usually roost under cover, feed at midday in open fields, and wander long distances from cover.

(2) Manner in which they roost: Native quail band together in coveys from twelve to fifteen to roost in a tight circle with tails together and heads facing out. In case of danger this manner of roosting facilitates a quick getaway. Pen reared quail have no preference as to covey size. Several coveys of fifteen to twenty birds have banded together to swell their number into coveys of forty-five to sixty. Their choice of roosting sites is haphazard; they usually roost wherever dark catches them. Instead of roosting in a tight circle with tails together and heads out like wild birds, they scatter over an area of many feet.

(3) Behavior on approach of danger: It is a well known fact that wild birds "freeze" when danger approaches; when flushed,they rise in unison. Pen reared birds do not show these traits. Some absolutely ignore both man and dog when approached. They continue to feed, dust, and preen without showing any signs of approaching danger. Upon being forced to fly, they take to the air two and three at a time instead of flushing in unison.

6. *Fusing With Native Coveys.*

As previously stated, the rate of survival of released quail is greatly determined by the number of birds that are able to join native wild coveys. The actual process of covey union was not determined during the process of this investigation. However, the approach of native wild cocks to released coveys was observed on many occasions. The native cock bird approached, and in every case, a fight ensued with a released cock. The final outcome of these flights was never determined, as the engagement was usually prolonged and the birds advanced beyond sight into the brush or dense cover. Repeated observations of coveys where native cocks engaged in the released cocks showed the strong native cocks usually dominated the covey. This indicated that wild birds were fusing with the released birds rather than released birds joining wild coveys. Whistling of released birds usually preceded ensuing fights between the cocks and continued so until no more fighting was in evidence. What became of the released cocks where fighting resulted is not definitely known; presumably, they were killed or joined other coveys. The fighting aspect is considered the major cause for long distances traveled by released cocks on spring releases. It is a matter of conjecture as to how the wild coveys accept the pen reared birds and vice-versa.

7. *Mating.*

Because of the difficulty in observing nesting quail, little was learned about the mating and nesting activities of released quail. In only three instances during the entire period of the project was a banded hen or cock seen with a brood of young; in no instance were both parent birds banded.

8. *Tendencies to Maintain Domestic Traits.*

Pen reared quail show little fear of man when first released. In two instances young boys caught released quail with their hands and returned them to the investigator. When pen reared quail are released near a farm dwelling, they will invariably go to the farmyard and associate with the farmer's poultry. Repeatedly, farmers reported banded quail feeding around their barnyards. However, no banded quail were reported seen around farm dwellings one month after release.

9. *Predation.*

One important factor that determines the per cent of survival of released quail is the fact that they are easy victims of many types of predators. A few of the most important ones known to have destroyed released quail during this study are foxes, house cats, owls, hawks, dogs, and hogs.

Data on destruction by predators was collected from observations and examinations of remains of quail eaten in the field. In many instances bands and feathers were the remaining evidence left by the fox. Several acts of predation by hawks were witnessed with the aid of binoculars. A considerable amount of reliable information was gathered from farmers reporting their house cats catching banded quail. In one case a house cat completely destroyed a covey of fifteen released quail in a short period of eighteen days. In another instance a hog, "pine-woods-rooter", was seen catching and eating a banded quail which had been released three days before.

10. *Weather.*

An important factor determining the per cent of survival of released pen reared quail is the weather at the time of release and for several days thereafter. If weather is dry and clear, chances for survival are much more favorable than if it is cold and wet. In the fall of 1944, two hundred twenty birds were released on an experimental area during a cold rain which continued for several days. None of these quail were seen again, despite several days' search after weather cleared.

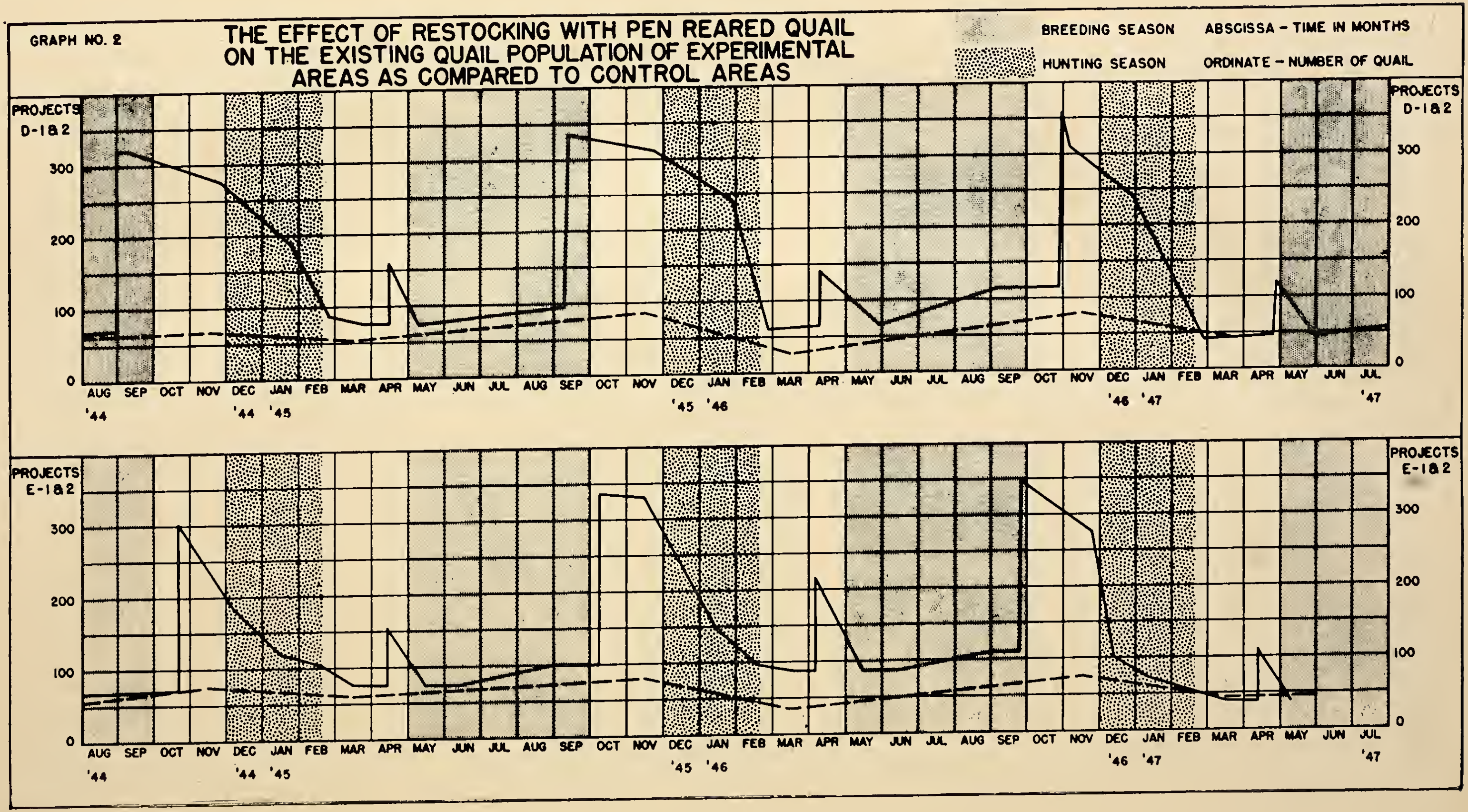
11. *Suitability of Release Points.*

Still another factor determining the rate of survival of released quail is whether there is desirable quail range surrounding the release point. Released pen reared quail did not indicate any ability to recognize or locate the most desirable range. In many instances grass fires denuded the area in the vicinity of release points shortly after release. In such cases these birds persisted on remaining in the burned area when suitable unburned range was only one-fourth mile away.

12. *Toll Taken by Hunters.*

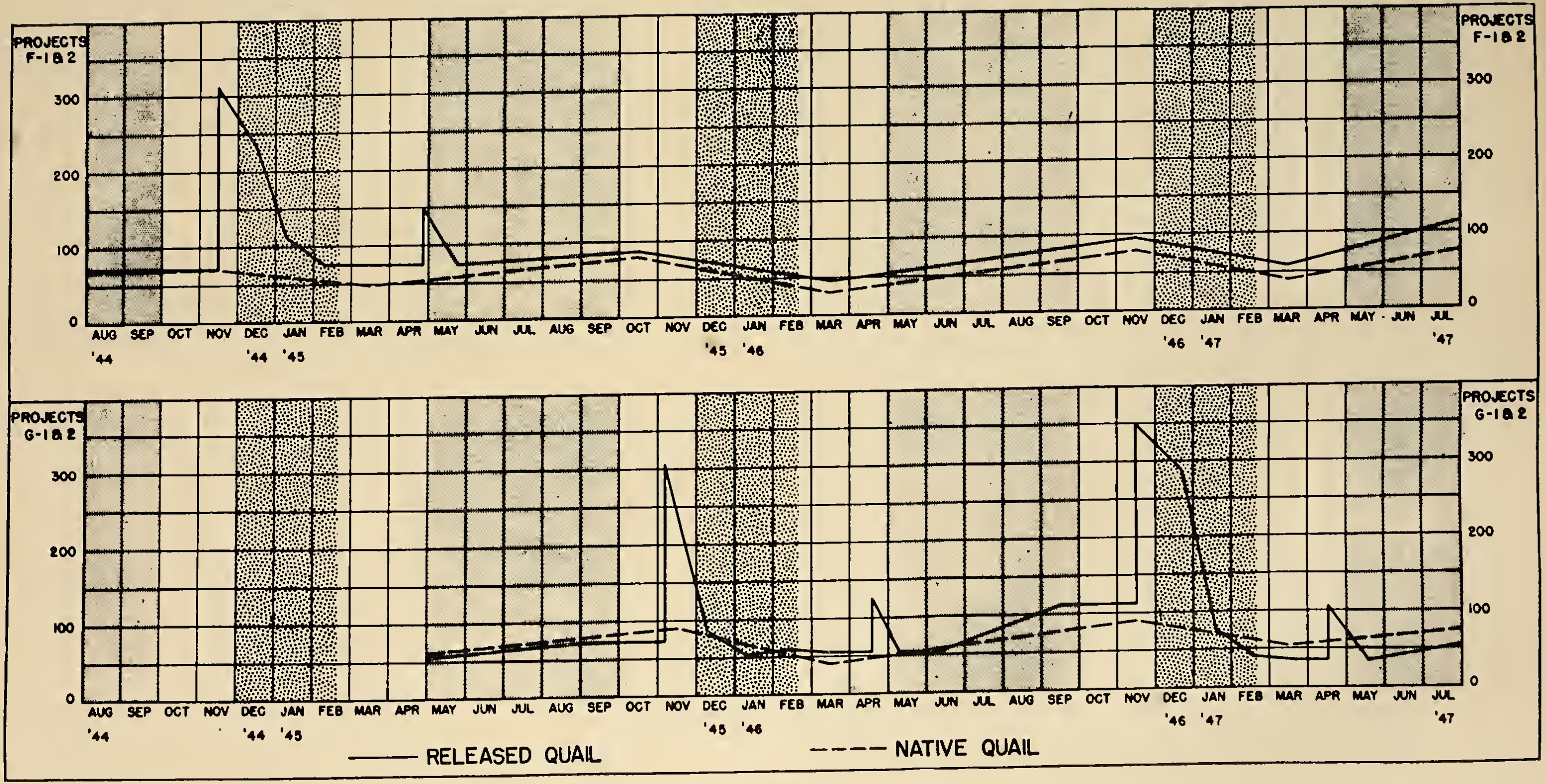
Despite the fact that released quail presented an easy target, leg band returns (all released birds were banded) indicated that relatively few were taken by hunters. In only three instances were hunters contacted in the field who had bagged banded quail. In each case the hunter was apologetic for having taken banded quail. For this reason it is presumed that a number of banded birds were bagged but not reported.

From the total of band returns, in no instance did hunters report banded quail taken in the hunting season that had been released the previous fall or spring.



GRAPH NO. 2

THE EFFECT OF RESTOCKING WITH PEN REARED QUAIL ON THE EXISTING QUAIL POPULATION OF EXPERIMENTAL AREAS AS COMPARED TO CONTROL AREAS


PROJECTS F-1 & 2
300
200
100
0
AUG SEP OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC JAN FEB MAR APR MAY JUN JUL
'44
'44 '45
'45 '46
'46 '47
'47
PROJECTS G-1 & 2
RELEASED QUAIL
NATIVE QUAIL

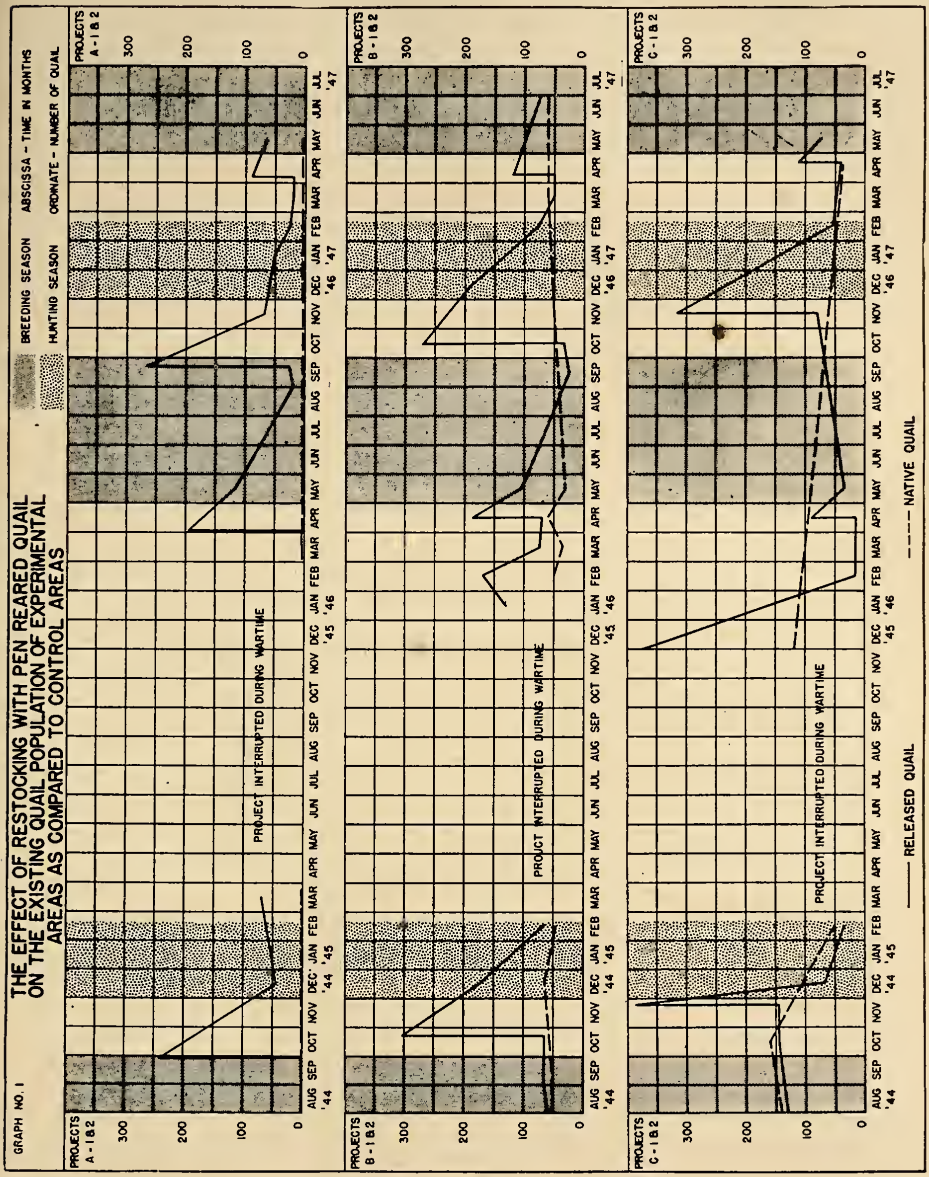
Predator Control Supervisor Joe Miller making a wolf set.

13. *Final Survivals.*

Under this topic it will be necessary to briefly summarize the activities of this project so as to give a clear perspective of the graph, *Survival of Pen Reared Quail and the Effect of Restocking on the Existing Quail Population,* which is to follow.

Survival of pen reared quail and the effect of restocking on the existing quail population: In carrying out the restocking studies on this project seven experiments were set up consisting of one control and one experimental area as nearly alike as possible in each case. The control and experimental study areas average between 2,000 and 3,000 acres in size and were set up in various parts of the State so that the results of restocking could be studied over the widest variety of range conditions. Following is the general description and location of each experiment:

Project A-1 & 2—An experimental and control area which was set up in the rice belt of southwest Louisiana. Here the land is flat, low, and subject to flooding which is


GRAPH NO. 1

THE EFFECT OF RESTOCKING WITH PEN REARED QUAIL ON THE EXISTING QUAIL POPULATION OF EXPERIMENTAL AREAS AS COMPARED TO CONTROL AREAS known to destroy the quail population. At the initiation of the experiment the area was found to be completely denuded of quail.

Project B-1 & 2—An area of cutover longleaf pine land which had the timber removed twenty or more years ago. This area represents a great portion of the land in southwest Louisiana.

Project C-1 & 2—Cutover longleaf pine land with the timber removed from three to five years ago. This area represents a small portion of the quail range in southwest Louisiana, but it has been proved to contain excellent quail food and cover but does not always give maximum quail production.

Project D-1 & 2—Hilly, north Louisiana wooded farmlands with diversified agriculture on small farms and characterized by oak, pine, and hickory forests.

Project E-1 & 2—Cutover shortleaf pine land charactertistic of much of the hill section of north Louisiana.

Project F-1 & 2—Fertile farmland of the Mason ridge type characteristic of northeast Louisiana. This region has extensive alluvial soil and hardwood timber.

Project G-1 & 2—Partial alluvial and hilly type land including an area commonly known as flatwoods.

Two biologists were employed in this study with Project areas A, B, and C being in the charge of one and D, E, F, and G being in the charge of the other. The first three projects were interrupted during wartime, but the last four were carried on continuously.

In setting up the experiments in each study area the native quail census was taken in both the experimental and control units. Pen reared quail were then released each spring and fall on the experimental unit until the project was completed, and a monthly census was made on both the experimental and control units throughout the study. In this manner a continuous check on the survival of the released birds and the effect of their presence on the total population of the area was obtained.

In general, the results of the experiments in all areas show that of 4,833 birds released on all experimental areas over the three-year period, only 289, or 6%, survived at the end of the period.

Three thousand five hundred and sixty-one birds were released in the fall of the year in lots of 240 to the study area, and 1,272 were released in the spring in lots of 72 to the area. Indications are that the fall released birds survived longer, but as will be pointed out later this may be due merely to the difference in the numbers planted. In relation to the general survival of all the plantings it is interesting to note that although these areas were observed frequently by trained biologists and also open to public hunting only 266 of the birds that were lost could be definitely accounted for at the end of the project. These were the birds from which bands were returned, and of this group only 130 were taken by hunters or a ratio of one bird killed by hunters for every 37 released.

Graphs 1 and 2 (note graph) of this project indicate clearly all of the data obtained on the survival of released pen reared quail and the effect of this added population on the total population of the areas studied. Several important facts are plainly pictured in the graphic results of these experiments. It should be noted that at the initiation of the experiments a native population of quail existed on all study areas except area A-1 & 2, and that in all cases the populations on the control and experimental areas were very nearly alike. This native population density averaged one bird to 32 acres which by all standards is a low level. All releases of pen reared quail on the experimental plots are superimposed on the normal native stock in the area and are represented by a vertical rise to the population peaks illustrated on the chart in the spring and fall of each year. The one exception to this is the peak population of 355 on Project C-1 in November, 1945. This was an abnormally high native population. It is clear from the graph that the release of pen reared birds brought about an immediate rise in the total population on the experimental plots after which a rapid decline set in until the population level approached that of the original native population level on both experimental and control plots. This clearly indicates a rapid loss of pen reared birds since no similar sharp decline is evident on the control plot nor does the decline tend in most cases to go below the original level of the native population on the experimental area. The death rate of the released birds is indicated by the fact that in no case did they maintain a significant rise in the population of the area during the fall and winter for longer than 160 days, and in most cases the total population was down near the original level by 100 days. In spring the survival extended over a period which averaged 30 days. This would tend to indicate that fall released birds survived better, but if a ratio is taken between the number released and the length of their survival in spring and fall, indications are that the rate of decline is very nearly the same with an expected average loss of from two to five birds per day at both periods of the year. (Note No. 14 under "Recommendations").

In general, the results obtained at the termination of the three-year period of research indicate that the release of considerable numbers of pen reared quail on various types of ranges have had little or no value in significantly raising the population level of the areas. This is clearly demonstrated by the fact that four of the seven experimental plots (B-1, D-1, E-1, and G-1) had no significant increase in the original population nor were they any better populated than the control plots. Project C-1 & 2 terminated with slightly more birds on the experimental area than on the control area, but the final population was 50% lower than the starting population. Project F-1 & 2 shows a slight increase in the final population over the starting population as well as the control, but no birds were released on this area during the last two years of the project; the increase can hardly be attributed to the release of pen reared birds. The last two years of this project in reality is a clear illustration of the normal change in quail population in an area as indicated by a rise with the breeding season and a fall during the hunting season.

Project A-1 & 2 is the only area where a rise in population brought about by the release of pen reared birds might be considered significant. This area originally had no quail on it, and by restocking some semblance of a population was maintained on the area throughout the duration of the project. It should be noted, however, that between releases the population became very low, and the trend was downward at the project's termination.

It seems clear from these experiments that restocking of areas with pen reared quail is of very little value because the birds do not survive in sufficient numbers to increase the population nor is there any indication that they breed readily after release. What then, is the cause of such a low survival rate? As has been pointed out in other parts of this report, there are many factors which seem to play a part in the death of released quail, but the significant point is that the loss from hunters and authenticated predation accounts for only a very small part of the total. Evidently starvation, inability to adjust to the wild environment, and a general inability of the range—without improvements—to support more than the existing population are the primary causes for a lack of success in restocking. Furthermore, it is clear that if the range is improved so that it can support a larger population, the already present native population is stronger, breeds better, survives better, and in all instances is more able to restock and is more satisfactory for restocking in the area. The use of pen reared birds in restocking is only indicated in areas where there are too few birds to breed or where a saturated population is demanded in a short period of time, and even here all evidence points to the fact that the use of trapped wild birds would give far better results than pen reared quail.

14. *Recommendations.*

The success of any quail restocking program can only be measured by the survival and reproduction of birds released. Data collected during the three years (1944-1945-1946, fiscal) of this project indicate an average of not more than 6% survival with practically no reproduction from birds released.

It must be assumed, therefore, that the practice of restocking quail through artificial propagation is advisable only under the most rare circumstances. In this respect a rare exception might be an area that had been completely denuded of quail. Restocking, then, with pen reared birds should be administered as the last resort and after the causes of depletion have been corrected.

When pen reared quail are to be used under the above circumstances, the following recommendations should be followed to obtain maximum results:

1. Only healthy quail should be used.
2. Sutiability of the range should be assured before quail are liberated.
3. Pen-reared quail should not be released near occupied farms.
4. Releases may be made in either spring or fall but in either case the number released in a given area should be large enough to allow for the expected loss of considerable numbers of the released birds and still retain a significant number of released birds on the area.
5. Feed (grain) should be placed on the ground at the release point at the time of liberation.
6. Favorable weather conditions should be taken into account.

PROJECT: 7-R, Field Border Investigation.

LEADER: Harold E. Wallace.

Progress Account

On February 16, 1946, work was initiated on a new project entitled *Field Border Investigation* (7-R). This program, with a probable duration of three years, should result in findings which should be of regional benefit to the landowner, farmer, conservationist, and SCS field technician alike. For purposes of study the research work was divided into two phases: (1) the culture of sericea-bicolor field borders, and (2) the value of sericea-bicolor borders for quail. Phase 1 logically precedes Phase 2 and includes border establishment and border maintenance.

As these experiments are to be carried out for the most part on state owned lands it was decided that Alexandria in

Rapides Parish would most conveniently serve as headquarters as that city is within easy access to the majority of the lands of this nature. Accordingly, on February 16 Alexandria was visited and consequently set up as the base of operations, and work radiated from this point.

Initially, it was necessary to establish experimental areas, so immediate steps were taken to survey the adjacent State lands for suitable sites. In very little time the first project was set up. Several weeks later two additional study areas were selected. These projects are discussed in the following paragraphs:

The first study area selected was located on the Alexander State Forest near Woodworth, twelve miles southwest of Alexandria, in Rapides Parish. The area was rather heavily forested with a Longleaf-Loblolly type stand, but permission was obtained from the State Forestry Commission to use their old seedling nursery for experimental plantings of bicolor. This tract of land covers about six acres and has been in a fallow condition for several years due mainly to the establishment of a new tree nursery and consequent abandonment of the old site. Labor was secured, and the land was flat-broken the last week in February. Twelve-foot strips were prepared and alternated with four-foot strips of fallow land. Seedbeds followed the contours of the land and were not fertilized. After allowing the prepared seedbed to settle, initial plantings were made on the 6th and 7th of March. Unhulled bicolor was used; rate of seeding was 15 pounds per acre. Approximately two acres were planted at this time, and four methods were used with each type occupying a half acre. The methods used were as follows: (1) broadcase and left uncovered, (2) broadcase and dragged to provide a very light covering, (3) drilled and left uncovered, and (4) drilled and lightly dragged to produce a minimum of cover. A heavy rain fell the night of the 7th to cover the material which had not been dragged. The first growth became noticeable fourteen days after sowing, and in eighteen days the plants averaged fifteen per square foot. Further plantings are to be made on this area to provide comparative material for study of early and late plantings.

The second study area to be selected was the St. Tammany State Forest located three miles east of Mandeville in

St. Tammany Parish. This tract of 2,500 acres was mostly of a flatwoods nature with thin stands of Longleaf-Slash-Loblolly Pine comprising the main timber type. *Myrica cerifera* is the most common shrub and *Andropogon virginicum* the most common grass. On the higher ridges, members of the Black Oak family are predominant. Plans on the St. Tammany project called for planting bicolor in ten-foot strips over a series of abandoned fire lanes. There are no good cleared lands available for the establishment of seed plots. The strip method is the more logical and should provide interesting results as they extend through both the flatwoods and the oak ridges. Plantings were originally scheduled for the middle of March but incessant rains prevented this, and planting was made in early April.

The third study area is not on a State Forest but is on State-owned land, namely the L. S. U. Quail Hatchery. This area is located in East Baton Rouge Parish just two miles east of the city of Baton Rouge. With the cooperation of Mr. Fred Pace, supervisor in charge of the hatchery, an area of slightly over one acre was prepared for bicolor plantings. Nine-foot seedbeds alternated with three-foot strips of fallow land. The seedbeds were disked once, allowed to be firmly packed by a terrific rain (six inches in three days), was lightly broken again, and then planted. All material was broadcase with two methods being used: (1) broadcase and lightly harrowed in, and (2) broadcase and left uncovered. No fertilizer was used. Plantings were made on March 28 and 29 with unhulled seed being sown at the rate of 15 pounds per acre.

No other study areas were established for this project as all sericea-bicolor plantings which had been made in the State were inspected and case histories prepared. These plantings were made mainly in 1942, 1943, 1944 and 1945, cooperatively by the Soil Conservation Service which was supplied seed and fertilizer by this Department. By a careful analysis of these case histories, a number of unsolved factors affecting the culture of sericea-bicolor field borders have been worked out.

Distribution of Borders.

Initial inspections of established bicolor borders were made on twelve Soil Conservation work units during 1946. It was the purpose of this inspection to ascertain the degree of success the plantings had in producing satisfactory stands.

The following table shows information obtained:

Work Unit	Farms Cooperating	Farms Inspected
Ringgold	21	14
Plain Dealing	5	5
Calhoun	6	5
Bastrop	9	9
Oak Grove	9	8
Farmerville	9	9
Winnfield	3	3
Ruston (Spencer)	6	5
Ruston (Barnard)	5	3
Jena	14	10
Many	8	8
DeRidder	13	13
TOTAL	108	92

Degree of Success

An arbitrary standard for classifying bicolor borders has been set up as follows:

1. Successful border:
   More than two stems per square yard.
2. Doubtful success:
   One or less than two stems per square yard.
3. Probable failure:
   Less than one stem per square yard.
4. Complete failure:
   No stems.

Using this standard of classification, the resulting tables are set forth:

Condition of Stands

Work Unit	Success	Doubtful Success	Probable Failure	Failure
Ringgold	6	0	2	1
Plain Dealing	1	2	0	2
Calhoun	2	1	1	1
Bastrop	3	2	0	5
Oak Grove	1	1	0	6
Farmerville	1	0	0	5
Winnfield	0	0	1	2
Ruston (Spencer)	2	1	0	2
Ruston (Barnard)	2	0	1	0
Jena	2	5	1	2
Many	3	2	3	0
DeRidder	2	0	5	1
TOTAL	25	14	14	27

The above table can be consolidated as follows:

Stand Classification	No. of Plantings	Percentage of Plantings
Successful	25	31.25
Doubtful Success	14	17.50
Probable Failure	14	17.50
Complete Failure	27	33.75
TOTAL	80	100.00

After the initial work of this project was completed, a clear conception was presented as to the extent of tangible material present with which to work. Efforts through 1947 were confined to a study of these borders to ascertain the influencing factors governing a successful field border program in farm game management.

Culture of Sericea-Bicolor

Field border maintenance. It is readily apparent that the drouth of 1948 was very damaging to sericea-bicolor field borders over the State. In many localities there was no rain for at least four months—May, June, July and August. Under these extreme climatic conditions plant growth was inhibited to an immense degree.

A survey of drouth damage was made in September on field borders over the northern portion of the State. Borders which had been planted in the spring, using seed, were in a critical condition. Eighty to ninety per cent plant mortality in a stand was common. The plants which did survive were usually those in the shade next to the woodland side of the border. Rains did occur during September and the plants which managed to survive now appear to be healthy and vigorous. The majority of the first-year borders are very "spotty" and the usage of transplants to fill in the gaps will be needed to produce a uniform stand.

Second and third year direct-seeded borders are not developing as rapidly as they would have under favorable conditions. Plant growth was stunted and very little seed produced. However, these stands survived nicely and with normal weather conditions and a good growing season should be seed producers next year.

Seedling-planted borders are doing satisfactorily, though there are great differences in growth due to the variations in soil types and planting sites. The average planted border appears to be about seventy per cent intact, with variations of from fifty to ninety per cent survival. Growth on the better sides often averaged six feet in height. These seedling-planted borders were established in January and February of 1947.

The sericea portion of the border as a rule is much better than the bicolor although it is also hit hard by drouth. More and more farmers are resorting to sericea as a hay crop and it is unfortunate that such a drastic season should come during this period of expansion. One work unit alone was responsible for the distribution and planting of 30,000 pounds of sericea this year at the farmer's expense. Rate of seeding was three acres to the 100 pounds; thus there were 900 acres planted to sericea for hay in the one work unit.

Use of Bicolor Seedlings. The use of bicolor seedlings is coming more and more to the front in Louisiana's field border planting program. In January, 1947, the first step was taken when 30,000 plants were used to establish 25 borders. These plants came from the S. C. S. nursery at Minden. This season, 1948, the nursery will dig approximately 65,000 plants, of which the State will receive a fair amount of this material. The Department has already requested 35,000 seedlings from this source, and if the request is granted, these plants will be concentrated in the Ringgold work unit in Bienville Parish as was done last year. The Ringgold work unit is now serving as the focal point for bicolor research as this area has more borders than any other in the State.

The State is gradually getting bicolor-sericea borders established after a rather slow start. Now that the Department is developing its own seedling nurseries and seed increase blocks there should be no difficulty in the future in obtaining material for planting.

Methods of Seed Harvest

Judging by relative costs it would appear that strict combining of the seed block would be the more economical —at least here in Louisiana. The basis for this qualifying remark is that here the bicolor grows to a very large height; on the blocks harvested the plants averaged about ten feet tall. Much difficulty was experienced in hand clipping the seed heads because of this height. When clipped, the seed heads were often more than five feet in length and thus would not feed properly through the combine (Allis-Chalmers 60 model). Also, the stems were large in diameter and quite tough after several days of air-drying. This condition resulted in an excessively high labor cost due to the slowness of the method and there was not too great a difference in the amount of seed obtained, though more was actually obtained by using this process than by purely combining the stand.

It may be added that the bicolor stems are cut back to the ground each year, thus the ten-foot height is an annual growth. This cutting back process also caused the bicolor to possess six to twelve stems per plant, resulting in a greater seed yield.

Use of Sericea Borders to Quail Predators.

Studies made indicate that sericea acreages harbor only the smallest forms of quail predators, predominantly the common rodent species. Work on this phase of research was initiated during the past year so all results obtained apply only to a portion of the year, October through December. Method of approach to this problem was systematic trapping as follows:

Ordinary spring-type mouse traps were used. Traps were spaced at a standard interval of ten feet through sericea acreages (as well as other types of vegetation). Traplines were put down in the late evening just at dark and picked up early the following morning. The same type of bait was used on all occasions—ordinary, uncooked oatmeal. All procedures were uniform.

One purpose of this study is to determine the average rodent population on sericea acreages as compared with densities to be found in other types of vegetation. If sericea is conducive to high rat densities, then the value of sericea for a quail habitat is seriously reduced. Data is presently being accumulated on this subject, but it is not yet of sufficient volume to form a basis for factual statements.

Rodents serve not only as predators but as food competitors. This fact is often overlooked as it is difficult to judge just how much of the food source is being utilized in this manner. However, it may be interesting to mention just one example which will indicate the degree of depredation made upon the food supply. While trapping in a sericea hay meadow in Sabine Parish in early December 1946, a Hispid Pocket Mouse (*Perognathus h. hispidus*) was caught. This is a rare species in Louisiana, yet because it possesses cheek pouches for carrying food, it serves admirably to illustrate the point. In the cheek pouches of this one individual were 923 sericea seed, two-thirds of them in the hull, the remainder clean seed. It takes very little imagination to understand how this amount would add up trip by trip, night by night, and individual by individual. More data on this subject is forthcoming.

Field observations made during the past year (1947) give rise to the following statements and indications:

Although the fox is abundant in north Louisiana, no individual has yet been flushed from a sericea patch nor have tracks, droppings, or other frequency signs been noted in this type of vegetation. Skunks are common but show no preference for sericea. Armadillos (though not considered a major detriment to quail) can be found occasionally in sericea, but no more so than in other vegetative types. Land terrapins have not been found in sericea patches. No species of hawk or owl have been flushed from a sericea hay meadow as yet. Most of the above mentioned predators can be found quite commonly in the broomsedge fields of the State. Evidently sericea furnishes good protective cover for rodents and quail as well. These are preliminary observations and should not be considered definite facts.

Value of Sericea-Bicolor Borders to Quail.

During the latter part of February and the first part of March, 1947, a number of quail were collected from sericea patches to determine if the birds were utilizing sericea for food. Several birds collected on February 22 near Athens, Claiborne Parish, did prove to have taken sericea in appreciable quantities. One bird had 437 hulled and unhulled sericea seed in its crop. All told, sericea composed approximately eighty per cent of the food taken by the birds which were examined. This is limited proof that quail do utilize sericea patches for food as well as for cover.

Sericea patches were also examined for quail usage in regard to roosting habits. Of thirty patches covered in February and March seventeen were found to have provided roosting places for coveys. Often it was discovered that the same covey would roost in or near the same spot night after night. Signs showing evidence of roosting eight or ten nights in succession in the same sericea patch were noted on several occasions. Thus, it may be stated that quail show a definite partiality toward this type of vegetation for roosting purposes.

Quail were taken by hunters from sericea patches in the northern parishes of the State quite extensively during the open season of 1946-1947. At all times of the day birds were to be found in this vegetation. Feeding and resting were evidently the reasons for their presence there. Birds taken from sericea patches often had *Lespdeza striata* in their crops rather than *Lespedeza sericea.* This is due to the fact that *striata* is often found growing under an overstory of sericea. The sericea at the same time provides cover for such feeding. Bird hunters are now beginning to consider a sericea patch as definite and reliable a source for finding a covey just as they already regard a black locust plantation.

* * *

PROJECT: 8-R, Wildlife Inventory and Management Plan.

LEADER: Lyle S. St. Amant

Introduction

Project 8-R was initiated March 1, 1946, and at that time was tentatively set up to terminate February 28, 1949. The terminating date was made tentative because of the many ramifications and great detail of so large scale a project. The general perspective of the project encompasses the determination of the game resources of the State, the relationship of the game present to its habitat, the types and relative abundance of game, and other pertinent information which will form a firm basis for a future long-range management program in Louisiana. The specific aim of the project is to inventory the game resources of the State and to evaluate the factors which influence game distribution and population.

To facilitate orderly and efficient progress a preliminary work program was set up which divided the details of the project into four phases as follows: Phase I, Organization of Basic Data; Phase II, Field Inventory; Phase III.

Compilation of Data; Phase IV, Final Report and Publication. The following report undertakes to outline the progress of the project during the twenty-two months it has been in operation and to give an analysis of some of the more important findings obtained to date in each of the phases of work outlined above. No attempt will be made to discuss all results or to draw any final conclusions because such a report would include a volume of material too large for this report.

Progress Account

Phase I: *Organization of Basic Data.*

This phase of the project, set up to cover the first four months of the study, included the investigation and application of methods for the preparation of base maps of each parish showing forest distribution, forest cover types, and game ranges. Aside from map investigation, a file of information on farming, land use, forests, industry, climate, geology, soils, etc., was to be set up for use in the correlation of the data obtained. Phase I was completed as per schedule.

A file of information, publications and data on land use, agriculture, forestry, industry, geology, soils, and a history of the game in the State is well established and is constantly being added to.

Mapping has been carried out continuously by the cartographer and the project leader using the methods devised during Phase I. To date it has resulted in the production of 113 maps, including finished maps of 55 parishes, some duplicates and numerous maps and charts of special areas and special phases of the project. Preparation of the parish base maps showing forest cover types and game ranges are now being made by the following method:

A. *Material Used in Making Basic Maps*

Sufficient U. S. G. S. Planometric quadrangles on a scale of two inches to one mile and Mississippi River Commission topographic quadrangles on a scale of one inch to one mile have been obtained gratis from the Federal authorities to map about 90% of the State in triplicate. By cutting, manipulation, and joining quadrangles excellent, accurate scale maps of each parish or area in question are produced showing all forest areas in a green overlay. Swamps and marsh areas are also shown in blue. By using this method excellent maps are being produced rapidly and at a minimum expense.

B. *Mapping Ten Per Cent of State not Covered by Quadrangles.*

Base maps of the few parishes not covered by quadrangles are being made from highway maps having a one inch to one mile scale. Forested areas are being filled in from AAA aerial photographs. Typing of cover is as described below.

C. *Forest Typing on Base Maps.*

Forest typing on the base maps is being carried out by a combination of three methods. Major forest types are determined from recent publications by the U. S. Forest Service and are checked against aerial photographs of the area. The proper symbols are placed on the map and it is taken into the field for the final check. In this manner accurate maps are being obtained. The forest density is indicated on the quadrangles because they are produced directly from recent aerial photographs.

Twelve general forest types are shown by inking in symbols on the maps and these in turn are further broken down in the legend and in the text to correlate with the Standard Forest Cover Types of the Eastern United States.

D. *Game Ranges and Distribution.*

The game ranges of all species not found to be state or parish wide are designated on the maps by the field technicians and permanently marked after the survey is complete. Where the range is considered to be over the entire area, small outline maps of the sections will be used, and game density rather than range limits will be designated. Using the above methods our large maps will show deer, turkey, squirrel, and wolf ranges in most cases. Quail, dove, waterfowl, and rabbit are usually found to range over most of the area and will be shown in relation to population density.

Phase II: *Field Inventory:*

The field inventory, by far the largest task of the project, is a parish by parish study, schedules to run continuously from July 1, 1946, until August 31, 1948. As of December 31, 1947, this phase of the project has been in operation for eighteen months and during this time the following progress has been made: Mapping has been completed in 55 parishes comprising a total of approximately 40,370 square miles or 83.1% of the total State area. Field surveys have been completed and the results analyzed and reported on in 21 parishes comprising an area of approximately 14,080 square miles or 29.0% of the total area of the State; and work is now in progress in another 10 parishes comprising an area of approximately 7,000 square miles or 14.4% of the State. The areas mapped, surveyed, and completed are shown in Fig. I.

The field work has been carried out by four field biologists under the direct supervision of the project leader. The greater part of the field work was accomplished during 1947 as three of the four field men were added to the project at this time. The rate of progress of subsequent work on the project will depend upon the number of field biologists attached to the project. It is indicated that the project can be completed in 1949 if a minimum of four biologists is retained.

Aside from the analysis of the data collected in the field numerous other types of data must be collected and correlated with the field data before a true picture of game conditions can be ascertained. It has become increasingly obvious as this work progressed that information on location, size, topography, geology, soils, climate, forest acreages, lumbering, agricultural acreages, agricultural trends, population trends, industrial trends and the general history of the parish or area in question must be collected, analyzed, and correlated with present and past game conditions before a true concept of game management for the State can be brought forth.

In the light of this fact, the actual census figures on game in a given area become of less importance than might be normally suspected at first glance. In the first place, the

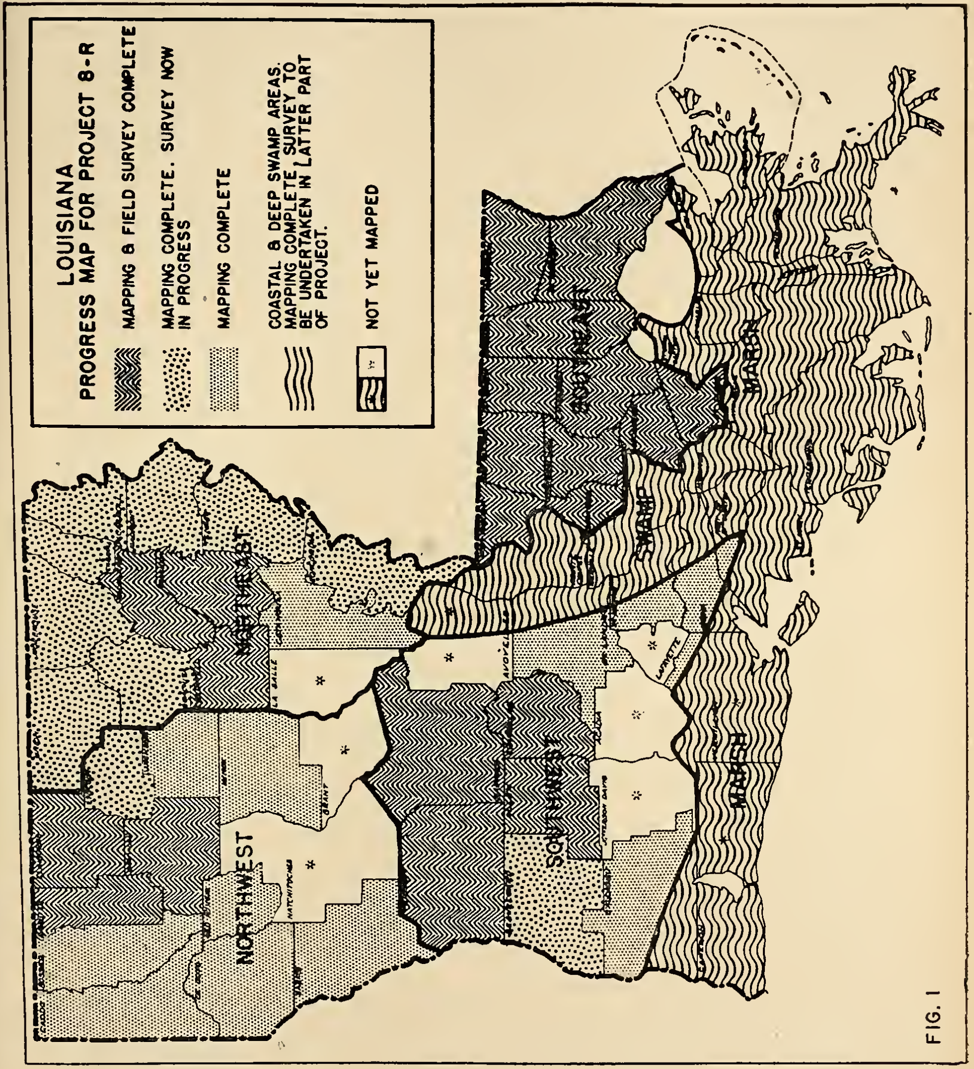

LOUISIANA
PROGRESS MAP FOR PROJECT 8-R
MAPPING & FIELD SURVEY COMPLETE
MAPPING COMPLETE. SURVEY NOW IN PROGRESS
MAPPING COMPLETE
COASTAL & DEEP SWAMP AREAS. MAPPING COMPLETE. SURVEY TO BE UNDERTAKEN IN LATTER PART OF PROJECT.
NOT YET MAPPED
NORTHWEST
NORTHEAST
SOUTHWEST
SOUTHEAST
SWAMP
MARSH
MARSH
LA SALLE
GRANT
NATCHITOCHES
LAFAYETTE
JEFFERSON DAVIS

FIG. I

normal fluctuations in the total population of a species from year to year makes a count at any specific time of little value other than as an index of the game present at that specific time. To be of any great value sufficient counts should be made over several years so that the population trend may be established and this should be carried out on various types of range so that comparisons between ranges can be made. It is also very true that the game population in an area is not always directly proportional to the success of hunting to be expected in the area by the public. In numerous cases during this study, the field biologists have found high game population densities in areas where hunting is considered to be very poor because of limited huntable range and dense cover. In such areas, regardless of the actual density of game found, the vast majority of sportsmen still complain of very poor hunting, a great lack of game, or extreme changes in the manner or ease of hunting when compared to past years. These same sportsmen bring pressure to bear upon the Wild Life and Fisheries Department to restock or increase the game in such an area when actually the available land is producing all the game it can support under the present land use program. On the other hand, in areas where the game population is relatively low but where large areas of land are available to the public on which to course their dogs and to shoot with freedom, we find the average sportsman generally satisfied with hunting conditions. Such changes in the character of the game ranges, the huntability of the ranges, and the annual game harvest are reflected for the most part in the history of game, lumbering, industry, population shifts, and hunting pressure in the parish or area in question. It is indicated that a careful consideration of these trends is of paramount importance in determining the best method of restoring good hunting in a given area. For this reason this program has laid more stress on why a situation has occurred and what should be done about it, whereas, the situation at present is only used as a relative index of what is considered to be good or bad in the way of game conditions or hunting in a given area.

The following discussion of the results obtained by this project to date is not an attempt to give a complete analysis of the work but rather will be confined to the more pertinent facts discovered and a short discussion of the past, present, and future trends in game conditions as indicated by an analysis of the facts at hand. Maps, charts, and graphs either of actual or schematic nature will be used where possible to avoid lengthy discussions.

Areas surveyed or in the process of being surveyed.

Twenty-one parishes have been surveyed and another ten parishes are now more than half completed, making a total of 31 of the State's 64 parishes on which considerable data have been gathered. The order in which the survey was undertaken was governed at first by the shortage of biologists and the general unfamiliarity of a new project. For this reason the parishes near the main office in Baton Rouge, Louisiana, were worked first so that constant supervision could be had, and any necessary revisions in methods could be readily coordinated. This resulted in all of the Florida Parishes being completed early in the project. With the addition of three field biologists to the project in 1947 the State was divided into five sections based on the topography, forest types and geology of these more or less natural divisions. (See Map, Fig. I). The survey was then initiated in the various sections with one or more biologists being assigned to each of those selected to be worked at this time. The various sections may be classified as follows:

1. The northwest section includes 13 parishes and is geologically the oldest section of the State. This area is made up of the Tertiary Uplands with underlying bed rock. Topographically, the area is high and hilly with relatively good drainage but poor soil. The climax forest is a mixture of shortleaf pine, loblolly pine, and hardwoods, but hardwoods may become dominant in the second growth forest.

2. The northeast section includes 13 parishes and geologically is of recent origin. The area is made up of two units, the Mississippi Alluvial Plain Unit and the Arkansas Alluvial Cone Unit. Topographically, the area is rolling to flat in nature with high, well-drained ridges and swampy, poorly drained interses. The soil is fertile and the climax forest is the bottomland hardwood type characteristic of a high bottom. Some pine may exist on the ridges but in most

cases the present forested areas are second growth bottomland hardwoods.

3. The southwest section includes all or part of 12 parishes. Geologically, the area is of relatively recent origin but is somewhat older than the river and coastal plain areas. It consists of four terraces made up along ancient coast line patterns; they are the Williana, Bentley, Montgomery and Prairie Terraces. Topographically, the area is rolling to flat with the slope to the south. The soils are poor in most cases, and in some cases poorly drained. The original forest consisted of longleaf pine except in the creek bottoms. At the present time all the pine has been cut and the forests are now either pine barrens or second growth pine.

4. The southeast section includes all or parts of 10 parishes. Its basic geology is identical for the most part with the southwest section, but its surface soils are more varied which resulted in more hardwoods appearing in the western half of the section. Generally speaking, the two areas are of the same formation but are separated by nearly 100 miles of Mississippi River bottomlands.

5. The swamp and coastal marshes form the fifth section and includes the remainder of the State. This area is geologically of recent origin and consists of the Deltic Plain and the Mississippi Alluvial Plain Units. The area in general takes in the entire coastal section and extends north for 150 miles in the Atchafalaya and Mississippi River bottomlands. Topographically, the land is flat and low with cypress-tupelo swamps and vast expanses of marsh making up much of the area. On ridges and natural levees, however, bottomland hardwoods are the dominant forest types.

At the present time work has been completed in the southeastern section and is now in full progress in the northwest, northeast, and southwest sections. The marsh and swamp area is purposefully being left until last because special equipment will be needed for this section.

History of Game in Louisiana. In attempting to determine the game conditions in the State at the present time and what can be done to better them, it was necessary for us to know how the present situation evolved. An examination of the history of game in all areas studied thus far indicates the changes in game conditions are closely tied in with the history of the State itself and particularly with the changes that have occurred in lumbering, farming, industry, and population. In other words, the land use pattern has governed the game picture probably more than any other single factor.

The history of land use and game in the State can be divided into four stages:

Stage I: From before the coming of the white man until 1800. During this time the State was a virgin wilderness, with only a few trading posts and very early settlements. The white man's presence in the area was insignificant insofar as hunting pressure was concerned, and hunting pressure from the Indians was a stable condition.

Several facts about game during the period are generally unknown by the average sportsman of today. It is generally assumed that in such early times that game was abundant everywhere. This is far from true. All indications are that even the abundant species were concentrated on good ranges while on poor range game was scarce. This was so true that the Indians divided the hunting grounds up among the tribes and practiced game conservation on a limited scale. There is also some indication that some species of game are more abundant today than during early times. This seems to be the case particularly with quail associated with farms. In general, indications are that deer, bear, cougar, wolves, turkey, fur bearing animals, and squirrel were abundant in early times but were concentrated on certain ranges and absent on others. Populations were known to fluctuate because of poor breeding, disease, famine, drouth, flood and fire. Quail, cottontail rabbit, and dove were found on the open land and prairies. These species also frequented the virgin pine forests, but indications are that populations were low in such areas. In general, the overall quail population must be considered to have been only moderate in this area. Waterfowl and migratory shore birds had vast wintering areas in Louisiana and were abundant or scarce in the areas according to the success of the breeding season.

Stage II: From 1800-1880. This was a time of increased settling and farming of a crude nature. The timbered area remained a virtual wilderness because poor transportation methods and hand labor prevented serious lumbering. Industrialization was still far in the future. During this period the Indians were forced from their hunting areas, and hunting pressure was not so much due to the increase in the number of white hunters as to the lack of regulations and the unwarranted slaughter of game for food and market. During this time certain species suffered more than others because of their market value, the ease of taking them, and the low natural breeding rate. In this group, bear, wolf, cougar, and to some extent turkey and waterfowl, were heavily hit. Bear, wolf, and cougar which reproduce slowly could not survive the hunting pressure placed upon them because of their market value or because they were considered serious predators. Turkey and waterfowl survived better during this stage because of their faster breeding rate. Deer were so abundant and widespread and reproduced more rapidly that they seemed to survive better although some decline is thought to have occurred. Squirrel and fur bearers seem to have remained plentiful until the end of Stage II. Quail and farm game increased during the period with the widespread development of farming of the crude type so valuable in the production of farm game.

Stage III: From 1880-1925. This represents a time in the history of Louisiana when the State may be said to have emerged from the wilderness. This emergence of the State into a settled and well inhabitated land wrought great havoc to the game resources because, for the sake of money, millions of acres of game ranges were destroyed needlessly. During this period practically all of the virgin forest of the State was decimated by the lumber interest, and with the forest, nearly all of the large game ranges were destroyed. During this period, the remnants of the bear, wolf, and cougar populations were all but decimated. Deer were reduced to a relatively low population by a decrease in range and heavy, unregulated hunting pressure. Turkey all but disappeared with the forest. Fur bearers and squirrel seem the least affected by the change but even in their case much of their upland ranges were destroyed and beaver and otter suffered great damage. Upland game, on the other hand, showed stability or advancement during this period. Quail in particular reached a phenomenal population peak that can never be expected to be reproduced in the State. The direct cause for the increase in quail was the vast expanse of excellent range produced in the cutover pine lands and the extensive but still rather crude farming in the area. This extremely high quail population was of short duration, however, and the peak had already passed and a decline had set in in most areas by the end of the period. This was due for the most part to the changes in quail foods available in pine lands from good to poor from the time of cutting until the sedges become dominant. This succession of plants usually takes about seven years to complete its cycle. In general, Stage III represents the time when the general game resources of the State were lowered to such a point that it became necessary to formulate strict laws governing the harvest of game to prevent complete annihilation of this valuable resource.

Stage IV: This represents the period from 1925 to the present. During this stage the characteristic changes in land use were expanding industrialization, increasing oil production, expanding population, bringing about more specialized and modern farming and reforestation, increasing restrictions of land from public hunting, and increasing hunting pressure. During the first part of this period the depression of the early '30's slowed down most of the changes named above, but in the latter half of the period the changes were very rapid. The effect of these changes in land use on game conditions seems to have been varied. Bear, cougar, wolf and turkey populations have continued to be low or absent. The reason for this is that they were either totally wiped out or reduced to such a low breeding stock on a restricted range that they have not been able to increase in the face of legal or illegal hunting pressure and general disturbance on their ranges. Deer seemed to have fared much better and in some areas seemed to show a population increase. Squirrel and rabbit have remained more or less stable during the period with squirrel showing possibly a small increase in the reforested and second growth forest with timber of operable size. Quail and waterfowl were the hardest hit species during the period. The quail range in the cutover pine lands was greatly reduced by reforestation and natural second growth forests. In the remaining denuded areas the food conditions became very poor as sedges became the climax plant. More critical still are the changes in the farm land, which after all is the true quail range in the State. Modern mechanized farming has reduced grain crops formerly necessary to feed farm animals and thereby has greatly reduced planted quail foods. Mechanization on farms has also resulted in wholesale destruction of natural cover and foods under the guise of clean farming, so much so that in some of the State's best agricultural areas we find the greatest decline in quail population. Finally, the great increase in cattle production and pasturage has been the cause of much reduction in quail population in many areas. The above factors seem to have had most to do with the general reduction in quail population in recent years. Hunting pressure has increased but seems to be the minor factor in the changing picture of quail conditions.

Waterfowl and shore birds have also declined during this period. The local factors aiding in their reduction have been reduction of wintering grounds by drainage and land reclamation projects, increased traffic and disturbance in the remaining wintering areas, heavy hunting pressure, and the destruction of food plants in fresh water areas by the encroachment of the water hyacinth and alligator grass. All of these factors, along with the destruction of breeding areas and changes in the breeding grounds in North America, have aided in the decline of the waterfowl and shore bird populations wintering in Louisiana.

The following figure (Fig. 2) is a schematic graph showing the changes in game populations during the history of the State. All points on the graph are purely arbitrary, but they do indicate the relative amounts of game at a given time and the changes in populations that have occurred

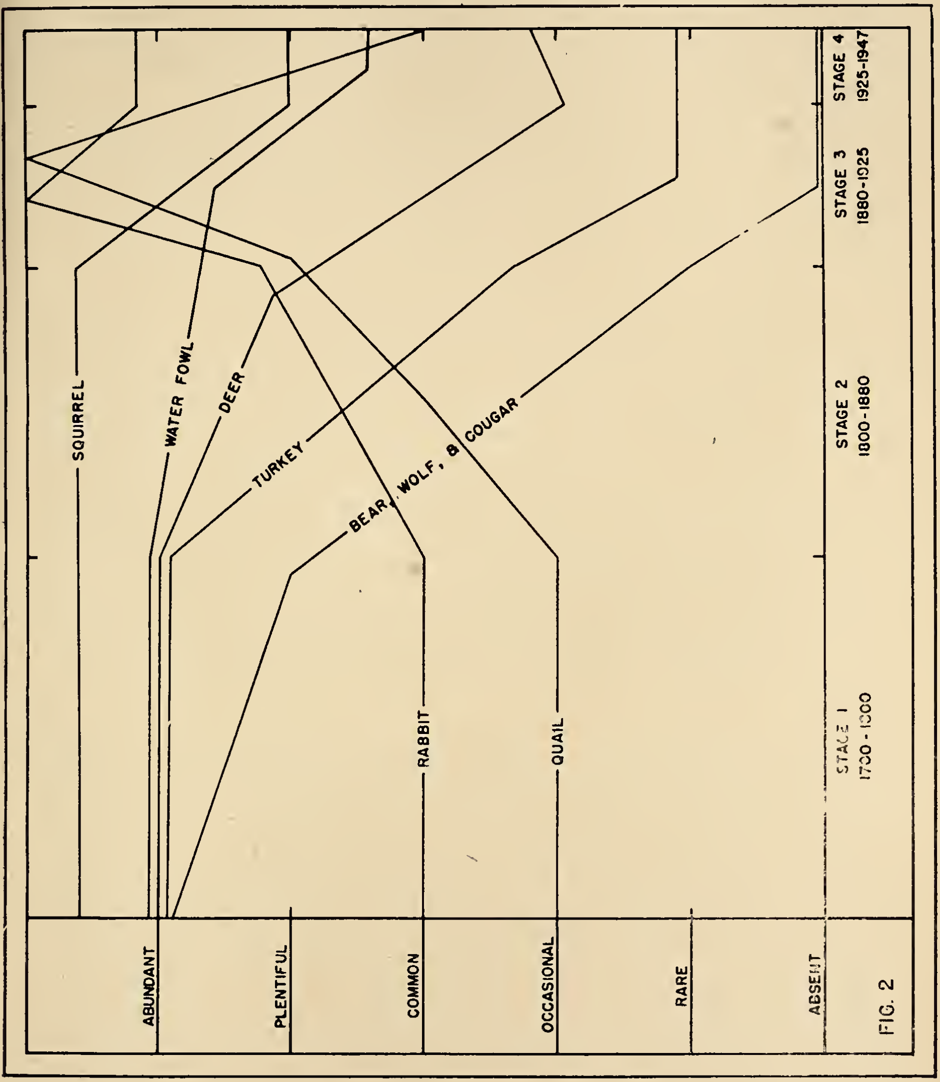

SQUIRREL
WATER FOWL
DEER
TURKEY
BEAR, WOLF, & COUGAR
RABBIT
QUAIL
ABUNDANT
PLENTIFUL
COMMON
OCCASIONAL
RARE
ABSENT
STAGE 1
1700 - 1800
STAGE 2
1800-1880
STAGE 3
1880-1925
STAGE 4
1925-1947

FIG. 2

over the entire period as based on findings during this study. The various stages used along the ordinate in the graph are as discussed above.

Results of Inventory of Present Game Conditions.

The general results of the game inventory in the parishes surveyed to date are tabulated in Table I, Fig. 3. The species listed are all of those that fit into the general game picture of the State. The abundance of each species as indicated is purely relative but is based on the actual inventory and field observations as follows:

When a particular species is given a "4" rating in a parish, it indicates that at the time of the survey there was a general abundance of the species, and hunting was good to excellent. The number "3" indicates that a species is common in the area, and hunting of the species may be expected to be generally successful. A number "2" rating indicates the species to occasionally occur in the area with hunting or trapping success sporadic and undependable. Numbers "1" and "0" indicate a great rarity or absence of the species with hunting or trapping not successful in the area.

An examination of Table I, Fig. 3, indicates that most of the species offer the hope of some degree of successful hunting over most of the areas surveyed. It must be remembered, however, that the rating is based on the actual productivity of an area in relation to its size and not on the demand that excess hunting might make. In other words, even if an area is classified as having an abundance of a certain species, this does not mean that it can take care of more than a resonable hunting load.

The following table is offered as a general picture of the game in the area. A more detailed picture of the conditions of the more important game species in the area follows:

TABLE I—GENERAL GAME INVENTORY

	Bear	Cougar	Wolf	White-Tail Deer	Fox Squirrel	Gray Squirrel	Cotton-Tail Rabbit	Swamp Rabbit	Fox	Skunk	Wild Cat	Mink	Otter	Raccoon	Opossum	Beaver	Turkey	Bob-White Quail	Mourning Dove	Wilson Snipe	Wood-Cock	Wood Duck	Mallard Duck	Other Duck Species	Geese	Rail	Coot
Allen	0	0	0	0	3	3	3	2	3	3	2	1	0	3	3	0	0	3	3	1	3	2	2	1	1	1	2
Ascension	0	0	0	3	3	4	4	4	2	3	2	3	1	3	4	0	1	2	3	2	3	3	2	1	0	2	3
Bienville	0	0	0	1	4	3	4	3	3	3	2	2	2	3	4	0	1	4	3	1	2	3	3	2	1	2	3
Caldwell	0	0	2	2	4	3	3	2	4	3	2	1	0	3	3	0	1	3	2	1	2	2	2	1	0	1	3
Claiborne	0	0	0	1	3	3	4	3	4	3	1	2	1	3	4	0	0	4	2	1	2	3	3	2	1	1	3
E. Baton Rouge	0	0	0	0	3	4	4	3	3	3	2	1	0	3	3	3	2	3	3	2	2	2	2	1	0	1	2
E. Feliciana	0	0	0	0	4	4	3	3	3	3	3	2	1	3	3	3	1	4	3	2	2	3	2	1	0	2	2
Evangeline	0	0	0	1	3	3	4	3	3	3	2	2	1	3	3	0	1	3	4	1	2	2	3	2	1	2	3
Livingston	0	0	0	3	3	4	4	3	3	2	2	3	2	3	3	3	3	3	3	1	2	3	2	1	0	2	3
Richland	0	0	0	1	4	4	4	3	4	4	1	2	0	3	3	0	0	4	4	1	1	2	2	1	0	1	2
St. Helena	0	0	0	1	4	4	3	3	3	3	1	1	0	3	3	3	2	3	3	2	2	3	2	1	0	2	2
St. James	0	0	0	4	3	4	4	3	1	3	1	3	2	4	4	1	0	2	3	1	2	3	3	2	1	2	4
St. Tammany	0	0	0	2	4	4	3	3	3	2	2	3	1	4	3	0	2	3	3	2	3	2	3	2	1	2	3
Tangipahoa	0	0	0	3	3	4	3	3	3	2	2	2	1	3	3	1	2	4	3	1	2	2	2	1	0	2	2
Vernon	0	0	1	1	3	3	3	2	3	3	2	1	0	3	3	0	0	3	3	1	3	2	2	1	0	1	2
Washington	0	0	0	2	4	4	3	3	3	3	2	2	1	4	4	0	2	4	3	2	3	3	2	2	0	1	1
W. Baton Rouge	0	0	0	3	4	4	4	3	0	3	3	2	1	4	4	0	0	2	4	2	2	2	1	1	1	2	2
W. Feliciana	0	0	0	0	3	3	3	3	3	3	3	1	0	2	3	0	0	3	3	2	2	2	2	1	0	2	2

LEGEND

4—Abundant
3—Common
2—Occasional
1—Rare
0—Absent

Results of Inventory of Various Species. Deer: The deer census has been completed and analyzed in sixteen parishes of which five are considered to furnish good deer hunting. The following table (Table II, Fig. 4) lists the parishes studied and gives a summary of the data on range size, range type, total population, average kill, and the potential deer productivity of the area studied.

The data in the table indicate several important facts regarding the deer picture in the area studied thus far. The principal concentrations of deer are in those parishes which have vast areas of swamp bottomland that afford protection for the deer from men and dogs. On the other hand, those parishes which afford easy access of deer range to men and dogs have few or no deer. This is true even though a study of the range in each case shows that the upland and higher bottomland forests offer much better food conditions than do the cutover cypress-tupelo swamps which have the most deer. The above facts indicate clearly that a management program is necessary to maintain deer in those areas showing low population. The main objective of such a program must be protection of the deer herds. This can be readily accomplished by the installation of refuges, and in some areas the complete banning of the use of dogs in the hunting of deer. The use of such management practices has proven their worth in other states, and even in this state our best deer hunting areas are either near refuges or some type of protected area.

The data summarized in the following table indicate an estimated total population of 7,461 head of deer on 555,920 acres of occupied range. This is an average density of one deer per 74 acres. On the other hand, those parishes having natural or artificial protection for deer have an average population density of one deer per 32 acres. It is clear that if refuges were established only on the present occupied range in the area studied, the deer population would double itself; and, if the additional potential range is managed, the total deer population should be raised from the present 7,461 to an estimated 30,000 population and the kill increased from 719 to approximately 3,000. Such action on the part of the Wild Life and Fisheries Department would raise the value of the deer resources in this area alone from $746,100 to

TABLE: II

DEER INVENTORY DATA

Parish	Type and Size of Occupied Range		Type and Size of Occupied Potential Range		Estimated Present Population	Avg. Pop. Density Occupied Range	Average Annual Kill	Estimated Potential Population**
	Swamp and Bottomland Hardwoods	Pine-Hardwoods and Upland Hardwoods	Ewamp and Bottomland Hardwoods	Pine-Hardwoods and Upland Hardwoods				
	†		†	†				
Ascension	37,120	none	10,000	none	1,480	25	140	1,700
Livingston	32,000	none	112,000	185,000	1,000	32	100	6,500
Tangipahoa	48,000	none	10,000	30,000	1,500	32	150	3,000
St. James	100,000	none	none	none	3,000	32	275	4,000
St. Tammany	105,000	none	none	none	150	700	23	2,000
W. Baton Rouge	50,000	none	none	none	150	330	25	1,000
Caldwell***	12,800	60,000	57,200	122,000	56	1,300	—	5,000
Richland	50,000	none	none	none	35	1,400	4?	1,000
Washington	25,000	none	23,040	55,040	25	1,000	3?	2,000
Evangeline***	6,000	none	30,000	none	23	300	—	700
Claiborne***	22,000	none	15,000	none	14	1,570	—	750
St. Helena	10,000	none	25,000	20,000	10?	1,000	0	1,100
W. Feliciana	none	none	40,000	none	0	—	0	1,000
Bienville	?	?	none	50,000	8?	—	0	1,000
E. Baton Rouge	none	none	16,000	none	0	—	0	300
E. Feliciana	none	none	none	none	0	—	0	—

* Figure represents number of acres per deer.

** Estimate based on total occupied and unoccupied potential range under proper management which should produce a deer to every forty or fifty acres.

*** Season closed by local Police Jury or deer are on protected refuges.

† All figures represent number of acres.

$3,000,000—each deer having an estimated value of $100 according to the U. S. Fish and Wildlife Service.

Bear, Cougar, and Wolf: The presence of bear and cougar (mountain lion) has not been established in the sections of the State surveyed to date. All efforts to track down reports of their existence have failed to disclose any authentic eye witnesses or else the stories were based on happenings of a number of years ago. Some wolves are present in the area studied, and there is evidence that they may be increasing on the more isolated ranges. The total number located does exceed fifty, and these are being trapped because of their predatious nature. It is very likely that these large game animals have disappeared or are about to disappear from the State. Restoration of these species is not advisable as the suitable range is limited, the project is too costly, and the predatory nature of the species in question could easily do more damage than good to the game conditions in Louisiana.

Squirrel: Squirrel conditions in the 21 parishes studied are generally good (See Table I). For the most part the heaviest population densities are to be found in the bottomland hardwoods and the bottom hardwood forest types. The parishes having the greatest acreages of such range, therefore, have the greatest squirrel population. In the parishes studied thus far there are approximately 3,500,000 acres of good to excellent squirrel range of which about 1,000,000 acres produce population densities of from 0.33 to 1.0 squirrel per acre, and the remaining 2,500,000 acres of the range produce population densities of from 0.10 to 0.30 squirrel per acre. From these figures the estimated total squirrel population in the parishes studied is between 750,000 and 1,000,000. The value of this game animal in this area of the State approaches $1,000,000, based on the assessed value of $1.00 per squirrel set by the U. S. Fish and Wildlife Service.

Although the present squirrel population is considered good, some recommendations for the betterment of the population can be made. It is expected that some increase in population will be had with continued reforestation, but this could be aided greatly if the illegal pre-season kills could be lessened. The great changes in pre-season hunting is the destruction of nursing mothers which results in the loss of the entire litter rather than one animal. A later season and education of the hunter seem to be the best methods of bringing this about. Although strict enforcement of game laws is a necessity, it is hard to expect even the best enforcement officers to adequately guard the vast acreage of squirrel range in this State.

Rabbit: The rabbit population in the parishes studied is and has been higher for the past thirty years than the average of the entire State. Some cyclic fluctuation in population does seem to occur periodically and the years 1945 and 1946 were a low point in this cycle. Studies in 1947 indicated that the rabbit population is now on the increase.

Actual census studies of the rabbit population in the various parishes have not been attempted because the range is so extensive and varied and the population so high that there is no need to determine factors pertinent to increasing this species. Nevertheless, certain estimates may be made that can be used in approximating the value of this game animal to the State. In the 21 parishes surveyed to date there are 3,328,534 acres of farm land, most of which is excellent range for the cottontail rabbit and approximately 6,000 acres of woodland, the major portion being considered good range for both the swamp and cottontail rabbit varieties. This means that in only 21 parishes there is between 5,000,000 and 9,000,000 acres of rabbit range that is estimated to produce between 1,000,000 and 2,000,000 rabbits valued at approximately one and one-half million dollars. The general estimate of the abundance of rabbits in each parish is shown in Table I.

Quail: The quail census has been completed in 21 parishes and the data fully analyzed in 16 of these parishes. The following table (Table III, Fig. 5) lists the parishes studied and gives a summary of the data on range size, range type, population density, and the total population in each parish.

The data recorded in Table III, Fig. 5, indicate several important facts about the quail conditions in the parishes studied to date. The most important fact is that the actual quail population is the product of the population density

TABLE: III

QUAIL INVENTORY DATA

Parish	Land Use Pattern			Approximate Acreage of Ocupied Quail Range		Average Population Density on Occupied Range	Average Population Density on Total Parish Area*	Estimated Total Coveys in Parish**	Estimated Total Birds in Parish**
	Timber Type Acreages								
	Bottomland Forests	Pine-Hardwood and Pine	Acreage of Farm and Associated Lands	Farm and Associated Lands	Cut-over Pine Forest, etc.				
Washington	72,146	229,464	217,451	216,278	37,000	0.244	0.143	5,150	61,800
Tangipahoa	59,452	336,896	189,621	189,621	161,704	0.166	0.111	4,860	58,320
Claiborne	72,109	176,543	285,845	285,845	......	0.200	0.117	4,764	57,168
East Feliciana	99,973	44,915	192,207	182,400	......	0.250	0.143	3,800	45,600
Richland	189,225	......	244,170	240,000	32,000	0.166	0.125	3,762	45,152
Bienville	82,138	274,989	220,083	220,000	......	0.181	0.074	3,318	39,820
Evangeline	134,084	123,769	176,096	163,187	15,000	0.181	0.075	2,687	32,252
St. Tammany	127,450	344,578	109,637	109,637	210,000	0.100	0.053	2,664	31,964
St. Helena	34,192	166,939	110,479	110,479	50,200	0.166	0.091	2,223	26,672
Livingston	144,982	236,551	83,217	83,000	......	0.250	0.050	1,730	20,750
East Baton Rouge	117,089	15,967	172,798	102,000	......	0.200	0.060	1,700	20,400
West Feliciana	112,133	24,615	134,501	134,000	......	0.147	0.079	1,641	19,698
Caldwell	121,888	182,833	86,240	50,000	......	0.333	0.066	1,387	16,650
Ascension	115,569	4,815	93,752	75,000	......	0.117	0.047	731	8,775
West Baton Rouge	69,104	......	50,517	45,000	......	0.125	0.043	468	5,625
St. James	94,969	......	59,090	45,000	......	0.091	0.026	341	4,095

*Population density figures indicate birds per acre.

**Estimates of total birds and coveys in parish is based on population density on occupied range and the size of the occupied range. Twelve birds is taken as the average covey size. Since quail populations fluctuate from year to year above figures may be considered to have a 5% to 10% error or even more if the year in question is particularly poor for quail production.

times the size of the occupied range. The first six parishes listed bear this out with the highest total population. In all cases a good to excellent density occurs on the occupied range and the parishes are either large or have extensive farm acreage suitable for quail range. The second group of seven parishes indicates clearly the effect on total population when either the size of the occupied range is limited or the population density on the range is low. This is particularly clear in the case of Livingston and Caldwell Parishes; both have good densities but very limited ranges. The last group of three parishes indicates what the effect of small ranges and low bird densities is on the total population. It also follows that the land use in the parishes governs the bird population for the most part. In those parishes with large farm acreages and other open range for birds and where the agircultural crops produced and the methods of farming are of such a nature that they produce good food and cover, the quail population is high. In areas where the food and cover is available but the range is reduced, or the reverse, where the range is extensive but the food and cover poor, we find only moderate populations. The poorest conditions are found in those areas where the agricultural crops suitable to the area fail to produce quail food or cover, where clean farming methods destroy the remaining natural food and cover, and where the quail range is confined only to farm land and limited in extent. This is generally the case in the bottomland sugar cane and rice producing areas.

Further examination of the data in Table III shows that an estimated 41,723 coveys or 500,676 quail exist on the occupied range in the area studied. This is an average of one quail per 5.2 acres on the occupied range, but where the total area is considered, the ratio is one quail to 15 acres. By any standard one bird to 5 or 6 acres is considered good shooting stock and on ranges where this is equaled or bettered, good hunting is usually had. However, one bird to 15 acres indicates that the overall population is too low to afford the best shooting.

In the final analysis the findings on this project indicate that although there is evidence of a considerable decline in quail population during the past 25 years, the available range is still producing nearly as many birds as can be expected under the present land use program, and the total of about 500,000 birds found in the area should allow for a harvest of from 200,000 to 300,000 birds annually. If this number of birds were harvested, the average quail hunter should be well satisfied with the success of his hunting. The question now arises as to why there are so many sportsmen who claim that quail have all but been eliminated from the area, and hunting quail is a fruitless task. There are several reasons for this feeling among the sportsmen and from their viewpoint their statements are accurate. In the first place, the increasing restrictions against public hunting on occupied quail range automatically eliminates 50% or more of the quail harvest. It is also evident that if posting of land, or similar restrictions, continue to increase, there will not be enough land available for public hunting in the future to take care of the hunters even if it is managed for maximum production of quail. Secondly, with restrictions decreasing the available range, that part of the range open to the public is badly overhunted, and there are literally too few birds to satisfy the demand of the hunters even though the land is producing a relatively good quail population. In the third place, many of our sportsmen were misled by the phenomenal quail population and ease of hunting in the cutover pine lands in the past years. Such a condition was not a normal one and can never be expected to be restored. It is therefore clear that quail hunting in the State should not be measured against so unusual a condition but rather should be measured against the more normal conditions of the better bird producing areas existing in the State at present. In the fourth place, the new methods of clean farming over much of the area have reduced the natural quail cover and food in the open farming areas forcing the birds to the dense cover of woodland and creek bottom lands. This has increased the difficulty of hunting to the extent that many people have given up quail hunting altogether. In the fifth place, it has been demonstrated that even the best dogs cannot be expected to find all the birds in an area. If the dogs find an average of 50% of the birds, this is all that should be expected. Cover also plays a large part in the success of finding birds. In thick areas the percentage of birds found is usually very low in comparison with the actual population.

The above facts illustrate clearly why quail hunting is considered poor even though a reasonably good population of 500,000 birds valued at one and a quarter million dollars is to be found in the area in question. The question facing the Department of Wild Life and Fisheries and the sportsmen of the State is what can be done to better quail hunting in Louisiana. Certain suggestions can be made to help the situation, but it should be clearly understood that to materially better the situation the mismanagement of land use over the past 25 years must be corrected as much as possible. Such a program cannot be an overnight affair based on the restocking of a few areas, but it must be a long term project carried out with full cooperation of sportsmen, land owners, and the Department of Wild Life and Fisheries. The following list of suggestions, in the order of their importance, is what can and should be done.

1. Through the proper educational campaign secure the formation of a mutual respect between hunters and land owners so that restrictions on hunting may be removed and the full harvest of quail obtained. This should immediately increase the annual harvest from 30% to 50% without injuring the present population in the slightest manner.

2. The introduction of marketable cover and food crops and/or the planting of food and cover especially for quail on all farms in the State would serve both to increase the bird population and to hold the birds in the open where shooting is better. This program is already under way but should be state-wide in scope. (See Projects 7-R and 6-D of this report.)

3. The purchase and lease of as much of the cutover pine land in the State as possible so that they may be managed and offered to the public as regulated shooting areas.

4. The setting up of small (500-1000 acres), intensely managed and stocked island refuges over the State that can be used as points of natural dispersal for breeding stock, as a place to train dogs, and as field trial areas.

5. Restocking may be used on areas completely denuded of quail after such areas have been properly prepared to

receive pen reared birds or in cases where it is necessary to rapidly bring the population of managed areas to a high level. General restocking in areas where the bird population is low because of improper land use is not indicated. (See Project 2-R.)

Turkey: Investigation of the wild turkey conditions has been carried out in 21 parishes on this project, but a state-wide investigation of the turkey population and range conditions was completed in 1947 on Project 3-R under the leadership of Mr. Flavil D. Hollis. For the sake of convenience and to save publishing space, a summary of the findings on both Projects 8-R and 3-R is being incorporated in this report. The results discussed below will include the findings throughout the entire State.

The combined investigations reported here have been carried out between 1941 and 1947, but it was interrupted for a period of three years by the recent war. In actuality three distinct surveys have been made on the turkey population. One was carried out in 1941-1942, and two were carried out in 1946-1947. The total findings on these surveys are shown in Tables IV and V. Only those parishes listed have been found to produce turkey, the remainder of the State having been depleted of its turkey stock during the past 50 years.

The general results of the turkey survey indicate that there are only 133 flocks of turkey in the State and they average 11 birds per flock. This gives a total of 1,463 birds with a value of approximately $30,000. A decrease of 25 flocks, or 275 turkeys, has occurred between 1941 and 1947. This is an overall decrease in population of 15% and a loss of resources to the State of approximately $6,000. These data indicate immediately that the turkey population of the State is at a critical low, and that if the decrease in overall population of approximately 15% between 1941 and 1947 continues at such a rate, there will soon be no turkeys within the State boundaries. Close examination of the data in Table V indicates that only three areas in the State have a population large enough to consider a safe breeding potential; namely: (1) Tensas and Madison Parishes in the Tensas River area, (2) St. Helena, Livingston, and St.

Tammany Parishes east of the Mississippi River, and (3) Morehouse Parish in the northeast section of the State along the Ouachita River. Figure 8 indicates these areas as well as the present and past range of the turkey in Louisiana.

TABLE IV* LOUISIANA WILD TURKEY INVENTORY FOR 1942

PARISH	Total Area**	Occupied Area	Per Cent of Parish Occupied	No. Flocks	Area Per Flock
Madison	650	259	40	45	5.7
St. Tammany	960	259	19	27	6.5
Livingston	662	176	36	23	10.4
Morehouse	831	240	18	14	10.8
St. Helena	420	152	15	9	7.1
Tensas	632	64	14	7	12.5
Washington	665	88	13	12	7.0
Union	918	84	4	3	12.3
Franklin	630	37	8	4	12.2
LaSalle	640	49	6	3	12.3
Red River	400	37	9	3	12.0
Allen	632	36	5	2	12.5
Caldwell	531	25	5	2	12.5
East Baton Rouge.	455	25	3	1	12.0
East Feliciana	464	12	3	1	12.0
Rapides	1,370	12	1	1	12.0
Winn	969	12	1	1	12.0
TOTAL OR AVERAGE	11,775	1,320	11	158	8.3

* Data compiled by George H. Bick.

** All figures for areas expressed in square miles.

TABLE V. LOUISIANA WILD TURKEY INVENTORY FOR 1946

PARISH	Total Area*	Occupied Area	Per Cent of Parish Occupied	No. Flocks	Area Per Flock
Madison	650	180	28	30	6.0
St. Tammany	906	154	17	14	11.0
Livingston	662	240	36	23	10.4
Morehouse	831	136	16	13	10.5
St. Helena	420	90	21	12	7.5
Tensas	632	81	13	10	8.1
Washington	665	72	12	9	8.0
Union	918	60	7	5	12.0
Franklin	630	30	5	4	7.5
LaSalle	740	37	6	3	12.3
Red River	400	37	9	3	12.3
Bienville	838	12	1	1	12.0
Caldwell	531	12	2	1	12.0
Catahoula	750	12	2	1	12.0
East Baton Rouge.	455	12	3	1	12.0
East Carroll	456	12	3	1	12.0
Natchitoches	1,291	12	1	1	12.0
Rapides	1,370	12	1	1	12.0
TOTAL OR AVERAGE	13,045	1,201	9	133	9.0

* All figures for areas expressed in square miles.

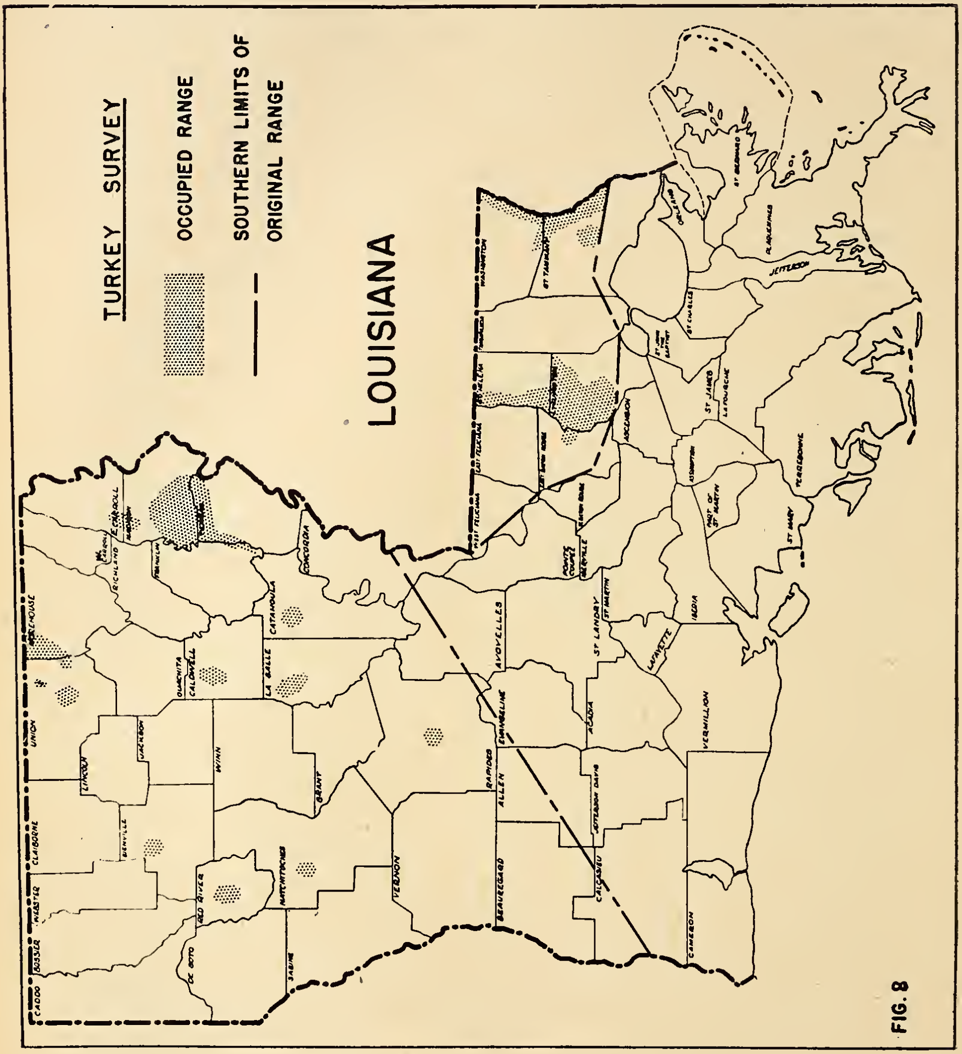

TURKEY SURVEY
▨ OCCUPIED RANGE
— — SOUTHERN LIMITS OF ORIGINAL RANGE
LOUISIANA
CADDO
BOSSIER
WEBSTER
CLAIBORNE
UNION
MOREHOUSE
W. CARROLL
E. CARROLL
RICHLAND
MADISON
LINCOLN
JACKSON
OUACHITA
CALDWELL
FRANKLIN
TENSAS
BIENVILLE
WINN
LA SALLE
CATAHOULA
CONCORDIA
GRANT
RED RIVER
DE SOTO
NATCHITOCHES
SABINE
VERNON
RAPIDES
AVOYELLES
EVANGELINE
ALLEN
BEAUREGARD
CALCASIEU
JEFFERSON DAVIS
ACADIA
ST LANDRY
ST MARTIN
LAFAYETTE
IBERIA
VERMILLION
CAMERON
POINTE COUPEE
IBERVILLE
WEST FELICIANA
EAST FELICIANA
WEST BATON ROUGE
EAST BATON ROUGE
ST HELENA
LIVINGSTON
TANGIPAHOA
WASHINGTON
ST TAMMANY
ASCENSION
ASSUMPTION
ST JAMES
LAFOURCHE
ST JOHN THE BAPTIST
ST CHARLES
ORLEANS
ST BERNARD
PLAQUEMINES
JEFFERSON
TERREBONNE
ST MARY
PART OF ST MARTIN

FIG. 8

Field observations during these surveys indicate that a significant turkey population only occurred on or was associated with large contiguous blocks of hardwood forest which was well isolated and protected. Fifty-seven per cent of the total population occurred in the bottomland hardwood regions. Livingston Parish is the only area where a large population is found in a pine-hardwood range, and even here all the flocks are associated with the creek bottom hardwood. The findings in these studies indicate the optimum turkey range in Louisiana to be a well isolated, protected area of at least 10,000 acres of which 90% is forested with a variety of timber types, one-half of which should be hardwood—predominantly oak. The area should be broken by well dispersed clearings on which is a luxuriant growth of native grasses, herbaceous plants, and succulent fruit-producing plants. A portion of the range should be free of overflow; cattle and hogs must be excluded from the area; hunting pressure must be carefully regulated; and general isolation of the area must be insisted upon.

All findings indicate that the decline in turkey population is due to a constant decrease in optimum range, free ranging of cattle and hogs, and a general disturbance of potential ranges by lumbering and cattle men. Restoration of turkeys can be had in the State if all or the majority of the limiting factors listed above can be eliminated on the areas selected as turkey preserves of shooting grounds.

Migratory birds and waterfowl: The number of migratory birds and waterfowl wintering in Louisiana is subject to considerable fluctuation dependent upon the general success of the breeding season in northern North America. In recent years there has been a general decline in ducks, geese, snipe, and woodcock because of poor breeding conditions. Dove breeding conditions, on the other hand, seem to have remained more or less stable.

As has been pointed out earlier in this report the vast wintering grounds of waterfowl and shore birds occurring in Louisiana will not be studied until later in the project, and a report on this will be forthcoming in the next biennial report. Certain observations on the species in question have been made in the parishes surveyed to date, and they are herewith summarized:

The annual dove population wintering in that area of Louisiana surveyed to date has declined, and the kill has decreased considerably. The reason for this is partly due to poor breeding, but the main cause seems to be our changes in farming methods. The new clean type of farming has reduced thousands of acres of natural food and cover. This is particularly true in the intensely farmed bottomland areas. Mechanization on farms has reduced the necessity of planting grain crops for livestock and has in turn reduced the dove feed. Increased pasturage of the unimproved type has also helped to reduce the winter range of this bird. Even with all these adverse factors the dove population remains moderately good, and the recommended improvement for quail range submitted earlier in this report would at the same time suffice as the proper management for dove areas. At the present time the dove population wintering in the areas survey is estimated to be from 500,000 to 750,000 with a potential value of one and one-half million dollars as resource to the State.

Waterfowl, woodcock, and snipe have followed much the same pattern as the dove, although they have been much harder hit by poor breeding conditions in recent years. The season of 1947-1948, however, indicates that an increase has begun. The winter range in the area under consideration, as well as over the entire State, has been markedly reduced in recent years by drainage and land reclamation projects. This will lower the population in the area even when the national population returns to normal. It is clear that future drainage or land reclamation projects should take into consideration the value of the wild life destroyed before such projects are allowed to be put into effect.

The annual winter population and kill of the species under consideration here is generally small in the 21 parishes surveyed to date. Only the swampy areas of the bottomland parishes, the low poorly drained sections of the upland parishes and the limited number of lakes in the area offer any resting and feeding grounds for waterfowl where they may stop for a short time on their way to the coastal marshes. Such a transient population does not lend itself to accurate census work but the annual legal kill may be estimated with some accuracy. Of the 21 parishes studied only 9 were found to have sufficient waterfowl wintering in them to make the duck kill significant. This group of parishes are those which border the Blind River Swamp Area, Lakes Maurepas, Pontchartrain, Borgne and Bistineau and those which are in the rice belt or have large swamp areas within their boundaries. In these parishes from 25,000 to 30,000 ducks are taken annually plus an unknown illegal kill. In the remaining upland parishes the kill is insignificant, being usually less than 5,000. The wintering grounds for snipe and woodcock in the parishes surveyed is more extensive than that for waterfowl since many ponds and low marshy areas are to be found in the area. The populations, however, have been low in recent years because of poor breeding conditions in northern areas. Because of this the season on sinpe is closed and no legal kill is made. The annual woodcock kill is small because of the low population, short season and the sporadic appearance of this species in the area. It averages between 5,000 and 10,000 for the entire area.

To better the waterfowl conditions in the parishes under discussion a wintering and feeding ground restoration project would be necessary. This would entail the impoundment of water, clearing and opening of existing waters, and the planting of waterfowl food plants.

* * *

PROJECT: 10-C, State Coordination

LEADER: John S. Campbell

Due to the increase in annual apportionments to the State from Federal funds and the expansion of the Federal Aid program, the Department initiated a Coordination Project July 1, 1946.

This project is responsible to the Department for the efficient mangement affecting an overall wildlife restoration program. Its primary function is to coordinate all activities under Federal Aid so as to obtain the best results and receive the greatest benefit for monies spent.

At the outset of this project there were seven projects in operation, namely:

1-R, Fur Resources Management Investigation.
2-R, Quail Habitat Investigation.
3-R, Wild Turkey Inventory.
6-D, Farm Game Habitat Improvement.
7-R, Field Border Investigation.
8-R, Wildlife Inventory and Management.
9-D, Wildlife Development on State Game Refuges.

Projects 1-R, 2-R, and 3-R have terminated, and final reports have been made to the Department. These data are now being prepared for publication.

Two new development projects are in the process of being set up. One is the Kisatchie National Forest near Natchitoches consisting of approximately 38,000 acres; another is in Allen Parish consisting of approximately 40,000 acres. The project on the National Forest area has been approved and will begin operation March 1, 1948.

Other development projects are dependent upon the availability of suitable lands. It is hopeful that the future holds promising possibilities of securing such areas from surplus lands of the War Department.

PITTMAN-ROBERTSON
REPORT OF EXPENDITURES
FISCAL YEARS 1945-46 AND 1946-47

ACCOUNT NO.		ACTUAL 1945-46	ACTUAL 1946-47
101.00	Salaries	$15,055.00	$27,957.25
204.00	Cleaning and Waste Removal	.91	1.36
210.00	Insurance	211.20	261.05
215.00	Freight, Drayage and Express	36.30	4.82
216.00	Printing	37.31	55.46
218.00	Rents and Use of Property	407.25	827.10
220.00	Repairing and Servicing Property	945.38	353.36
224.00	Technical and Mechanical Services	17.08	46.00
226.00	Telephone and Telegraph	121.98	249.94
228.00	Traveling Expenses	4,093.94	8,339.08
301.00	Building Supplies	.26	3.43
302.00	Lumber	103.04	110.12
303.00	Paint and Supplies	49.29	61.71
307.00	Container Deposits	30.00	......
308.00	Educational and Recreational Supplies	27.86	48.14
310.00	Electrical Supplies	1.57	30.71
314.00	Feed	190.00	240.00
320.00	Fuel	......	2.84
322.00	General Plant Operating Supplies	33.36	111.09
324.00	Hand Tools	43.18	39.23
326.00	Horticultural and Farm Supplies	1,175.62	889.79
328.00	Household Supplies	173.31	......
330.00	Janitorial, Laundry and Cleaning Supplies	......	6.24
336.00	Motor Vehicle Supplies	508.85	799.24
338.00	Office Supplies	31.96	39.09
342.00	Repair Supplies	529.05	110.30
348.00	Drainage System Materials	27.23	18.40
602.00	Automotive Equipment	......	806.09
614.00	Engineering Equipment	132.30	......
616.00	General Plant Equipment	224.10	361.48
620.00	Household Furniture and Equipment	27.93	......
630.00	Office Furniture and Equipment	......	221.17
	TOTALS	$24,235.26	$41,994.49
	Federal Appropriation	$12,946.09	$35,275.28
	State Share	4,315.36	11,758.42
		$17,261.45	$47,033.70

Northwest Louisiana Fish and Game Preserve. Sill across the Chivary.

Northwest Louisiana Fish and Game Preserve

The Legislature of 1946 through Act No. 83 Appropriation No. 885, appropriated $30,000.00 for the repair of Allen Dam and the construction of a sill in Bayou Chivary in order to hold the proper water levels in this preserve.

In connection with these projects, it was necessary to move the care-taker's cottage at Allen Dam. All of these projects have been completed. After the sill in the Chivary had been completed it was found that an additional height was necessary to raise the water high enough to take care of the water levels in the prairie which is part of the Northwest Louisiana Fish and Game Preserve. This project has been approved and will be completed this summer. When this project is paid for, a total of $28,036.86 has been expended from the appropriation of $30,000.00.

REPORT OF JAMES NELSON GOWANLOCH,
Chief Biologist

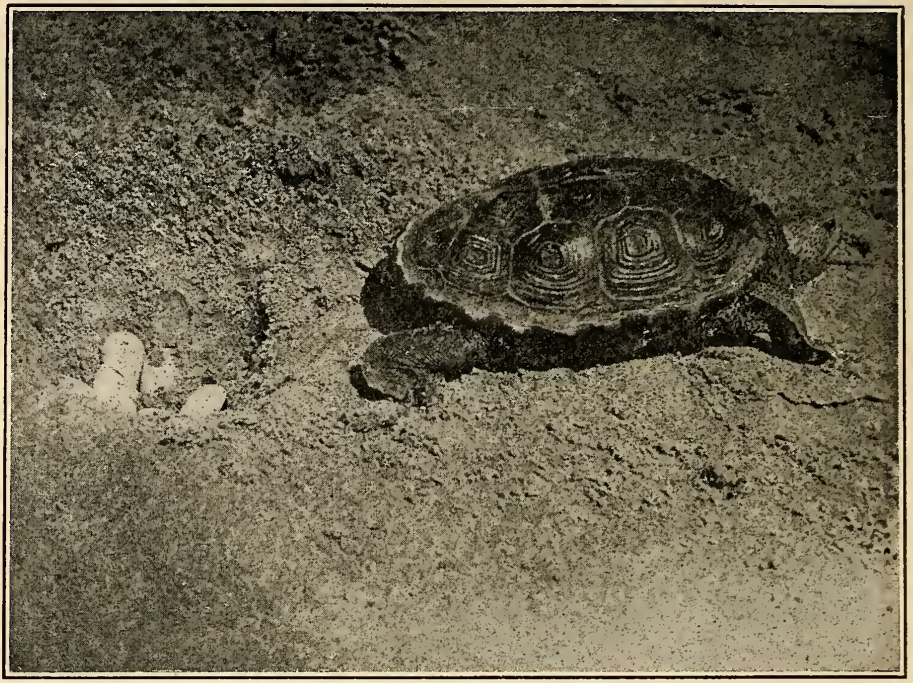
Research Expansion Hampered by Personnel Lack

Needed expansion of scientific investigation of biological natural resources has been greatly hampered by difficulty in securing scientific personnel. This is true not alone of Louisiana but of the entire United States. Lack of available trained scientists is due largely to the expanded educational programs, whereby virtually all higher institutions of learning have increased their scientific staffs also, is due also to the almost universal endeavor on the part of all progressive states to expand their conservation research programs and is further due to the fact that salary scales operating for scientific personnel in state work come far indeed from matching salaries offered for similar work in private industry. One fundamental factor also is naturally that scientists or individuals who would otherwise have entered upon higher training for scientific careers were engaged in duties with the armed services during critical years of their lives. This lack of adequately prepared technicians, coinciding with the constantly increasing demand for them, has created a situation unprecedented in American scientific history.

Water Hyacinth Eradication Program

During the biennium, the Chief Biologist was much engaged in the supervision together with Dr. Alexander D. Bajkov, of the technical scientific aspects of the water hyacinth eradication program. Toward this end he endeavored to assemble as completely as possible, a concentration of information covering present knowledge of the water hyacinth, the damage caused by this plant and the methods, mechanical and chemical, whereby it can be controlled and finally eliminated.

This program involved, for example, correspondence by the Chief Biologist with the leading botanical authorities of every Central and South American Republic and of the three Guiana. Cooperation was remarkably full and friendly resulting in the acquisition of a vast amount of hitherto un-

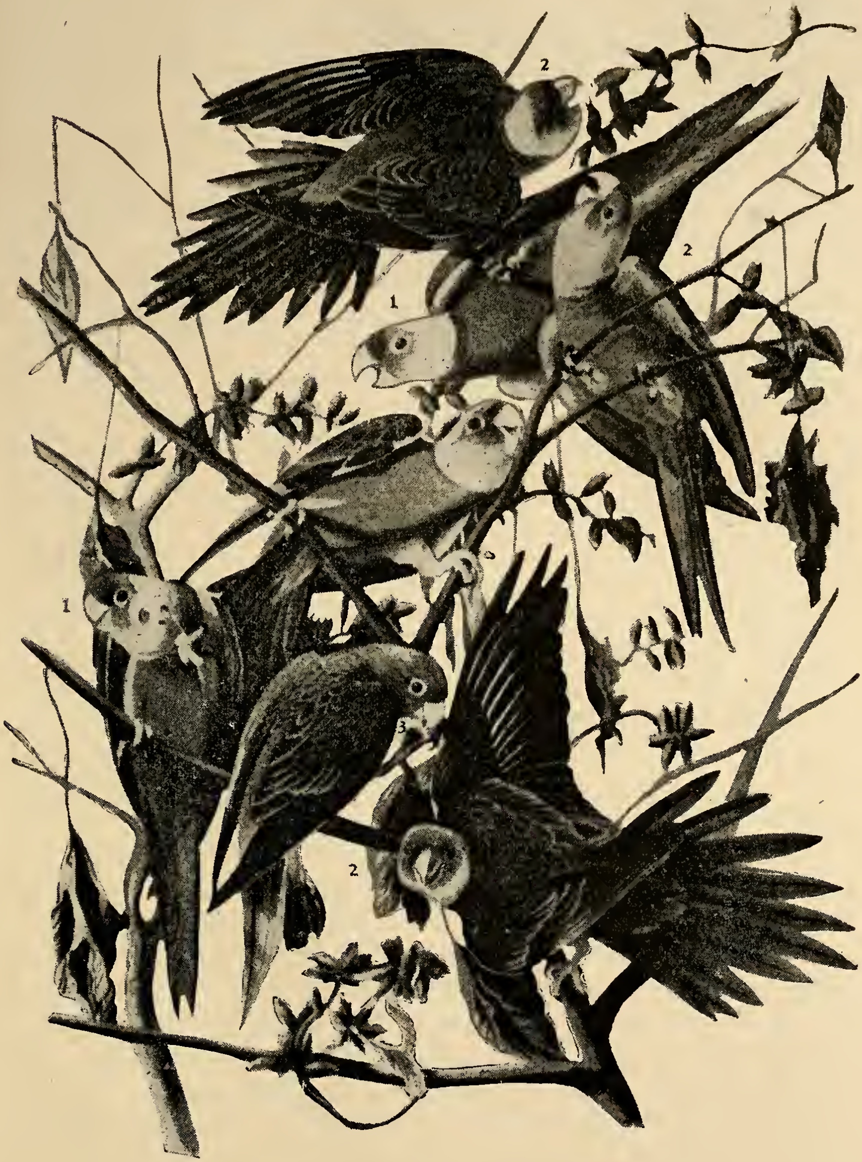


Planting of 1,400 young diamond back terrapin throughout the coastal parishes of Louisiana was carried out by the Chief Biologist as a contribution to the rehabilitation of this valuable seafood.

Diamond back terrapin are the most expensive of all seafoods and at the same time one of the most delicious. Heavily fished, their numbers have become reduced and it is hoped that these plantings will aid in reestablishing this nationally prized but now dwindling menu item. The diamond back terrapin above is shown depositing her eggs in the sand.

available data. Correspondence was also conducted with other distant governments, for example in India, Australia and Africa where the water hyacinth is also a pest. Particular search was also made for any possible economic use of this profoundly disastrous plant pest. Such search was completely in vain.

Accumulation has been carried out also of published data on the water hyacinth and all phases of its control. Such accumulation includes the collection of original, published papers wherever they are available and of microfilm of important scientific papers that can no longer be secured. The cooperation of the Library of Congress in Washington, D. C., in providing such microfilm has been of extreme value. All of this centralized information, tabulated for easy access,



The Louisiana and Carolina Parakeets, here superbly drawn by John James Audubon (the original is a colored plate in the Elephanto Edition of the ("Birds of America") emphasize the need for the study of and applied protection for Louisiana's wildlife.

These beautiful birds, once abundant, are now extinct.

will make possible sound progress of the broad program of water hyacinth extermination. A report, prepared by the Chief Biologist and Dr. Alexander D. Bajkov, on the scientific aspects of which appears elsewhere in this biennial report.

Oyster Investigations

Oyster work has occupied a considerable part of the Chief Biologist's time particularly during the first year of this biennium. The appointment of Dr. H. Malcolm Owen and scientific assistants for his work has resulted in the setting up of an intensive long period program of investigations into the oyster situation in Louisiana particularly the problem of the causes of the wide and mounting mortality of oysters which have occurred within recent years.

The Chief Biologist presented technical evidence before the Congressional Committee in support of the claims of the State of Louisiana and the oyster men of Louisiana for restitution for damages resulting from the opening of the Bonnet Carre Spillway. An estimated three and one-half million dollars worth of oysters were destroyed in Louisiana and adjacent areas of Mississippi by this necessary action on the part of the United States Engineers in flood control. The Chief Biologist, in the course of these investigations conducted surveys of the damaged areas in cooperation with James N. McConnell, Director of the Division of Oysters and Waterbottoms, and Dr. A. E. Hopkins, the then Director of the United States Fisheries Laboratory at Pensacola, Florida. This survey, at the request of the Seafoods Commission of the State of Mississippi, also covered those areas of that state that were involved. The results of these studies were presented before the Congressional Committee in Washington and were subsequently printed as an official federal record. Because of long established policy regarding flood damage reparations where off-shore equities are involved, the whole matter still remains in abeyance and the carefully prepared biological data presented before the Fisheries Sub-Committee of the Marine and Fisheries Committee of the House of Representatives are available in officially published form as basic technical data.

The Chief Biologist presented a paper before the National Shell-fisheries Association (of which he was at that time, National Secretary) on the subject of the grave dangers involved in proposed introductions of Japanese oysters into United States waters. It was made clear and the view was fully supported by oyster biologists elsewhere that although previous experimental introduction of Japanese oysters into southern waters, which introduction was made in spite of protests against it, had failed, nevertheless there was also the possibility that some such subsequent introduction might succeed, spread and become a catastrophe. It is pleasing to note that the oyster men of the State have become equally alert to this danger. Whereas they once believed Japanese oyster introduction and culture highly desirable, they are now well aware of the possibilities that propagation of Japanese oysters might conceivably cause great disturbance and damage to our fine native stock. The Chief Biologist outlined the rigid precautions which must be observed in any experiments involving either the Japanese oysters or other foreign species, if such experiments can be conducted with any degree of safety. Specific legislation prohibiting introduction of foreign species of oysters without special state permit, has been passed by a number of states.

Shrimp Researches

The Chief Biologist continued to co-operate with the Shrimp Investigations conducted by the federal government and several other states. The reports of these long-term studies are now about to be published by the federal government. The Chief Biologist undertook considerable responsibilities in relation to the public hearings conducted for the presentation of the case for a new shrimp law providing protection for shrimp during the winter when the rate of shrimp growth is very slow and also providing protection for the shrimp during the summer when the young shrimp spawned in the earlier months of the year are growing very rapidly but have not yet attained market size. It is believed that the shrimp law as enacted by the Louisiana legislative session is biologically the soundest yet placed in effect in Louisiana, as far as season is concerned. As far as the propagation of shrimp is concerned our commercial sea shrimp (also called White shrimp and Lake shrimp) apparently requires no protection during breeding season. This is made clear by most careful scientific studies. It has been found that a single female shrimp may produce as many as eight hundred thousand eggs and that females with ripe eggs may occur during eight of the twelve months of the year. There is no evidence to support the popular opinion that the shrimp supply is becoming less, since the available figures indicate that production has leveled off neither significantly increasing or significantly decreasing. The impression that the shrimp supply is decreasing is undoubtedly due to the fact that the number of boats fishing for shrimp have greatly increased in number, size and power. The fishing pleasure is intensified and the crop is divided up among more and more producers. The intensity of the fishery is spectacular when, for example, from a plane the observer can count fifty-nine shrimp boats operating in one area. Circling constantly and constantly crossing each other's paths, such a fleet of boats can harvest the shrimp present in a very complete manner. Some problems involved in the shrimp fishery are reflected in the address entitled "Broad Aspects of Development of the South's Marine Assets" which appears below.

A survey of the size characteristics of the shrimp taken in the fishery was conducted by the Chief Biologist with the co-operation of William W. Anderson and Joseph E. King of the United States Fish and Wildlife Service, when at chosen intervals during the shrimp season scientific samples of adequate numbers were secured and measured. This sampling procedure will be continued to check the effects of the new shrimp law. It should be pointed out that a very considerable dislocation of shrimp and other marine forms occurred as a result of the violent tropical hurricane of September 19, 1947. Shrimp for example, were fished in considerable quantities at Manchac where they had not been taken for six years and, in other areas along the coast, marine fish such as flounders appeared miles inland from points where they were known normally to occur. The importance of the systematic sampling of shrimp occurring in the shrimp fishery to ascertain kind of shrimp present, size, growth rates and movements of shrimp is of greatest practical importance.

It was unfortunately necessary to suspend the activities of the shrimp laboratory established at Morgan City by the then Louisiana Department of Conservation, due to loss of personnel because of the industrial changes of wartime. It is urged that this research be reactivated as soon as is possible and maintained in an adequate manner since the shrimp fishery is not only the greatest marine fishery of the whole South but is also one of the great fisheries of the world ranking in the last "normal" pre-war figures as sixth in volume and fourth in value of all of the commercial fisheries of the United States and Alaska. It is most necessary that the course of development of the shrimp fishery which centers so much of its landings in Morgan City and other coastal areas, be kept under scientific observation so that any factors that should arise to disturb it or to endanger in any way its optimal production can be immediately noted and remedial measures to offset damage to the fisheries as a whole devised and put into effect.

Development of Crab Fishery

It appears clear that Louisiana possesses possibilities for development of its crab industry far beyond those of any other state in the union, a situation which also exists with reference to the potentialities of the oyster industry in this state.

However, it is equally clear that the methods at present used in the harvesting of the crab crop are probably as inefficient and obsolete as any of those in our Louisiana fisheries.

The Chief Biologist has undertaken a program of introducing other methods of crab fishing which not only are more productive but are also greatly superior in their conservation values. This will take time since it is far from easy to change over a traditional fishing method to a new operating procedure. Much study has been given to the method of trapping, by means of a "crab pot" used with such success in the states of Maryland and Virginia. These pots are constructed of chicken wire, are inexpensive (costing only $2.50) and when galvanized by dipping in zinc at intervals of about six months, can be effectively used for a long time. The great advantage of the use of crab pots in contrast with the use of baited crab trot lines is that whereas only the hungriest crabs cling to the bait when the trot line is raised crabs in all various conditions of growth readily enter the crab pots. Furthermore, when these traps are lifted the undersized crabs, injured in no way, can be returned to the water for further growth. Study of the fishery as conducted in the Chesapeake area reveals that this method has fullest support of the crab fishermen themselves and of the deeply interested conservation agencies.

Complete information covering the details of construction of the Chesapeake Bay type of crab pot will be very gladly furnished to anyone who wishes them and examples of the trap itself can be examined at the Department of Wild Life and Fisheries.

Louisiana possesses the peculiar advantage in that along its extremely extensive coast line there exist ideal crab nursery grounds and the individual crabs are throughout their life history under the jurisdiction of the State of Louisiana whereas by comparison the crabs of Maryland pass one part of their life history in Maryland waters and another part of their life history in Virginia waters and thus come under frequently conflicting jurisdictions as far as regulation of the fishery is concerned.

Lake Management Studies

The Chief Biologist, during the biennium, has continued to cooperate with the Louisiana State Parks Commission in a broad program of lake management. The information therefrom derived is of highest value not only to any state program of development of fishing recreational resources but also provides answers to individuals since the results of all such studies will be made thus available. Particular emphasis has been placed upon the control of objectionable water plants. The water hyacinth researches constitute a separate program. A report on which is elsewhere given in this biennial. Three plants, all of which happen to be mem-

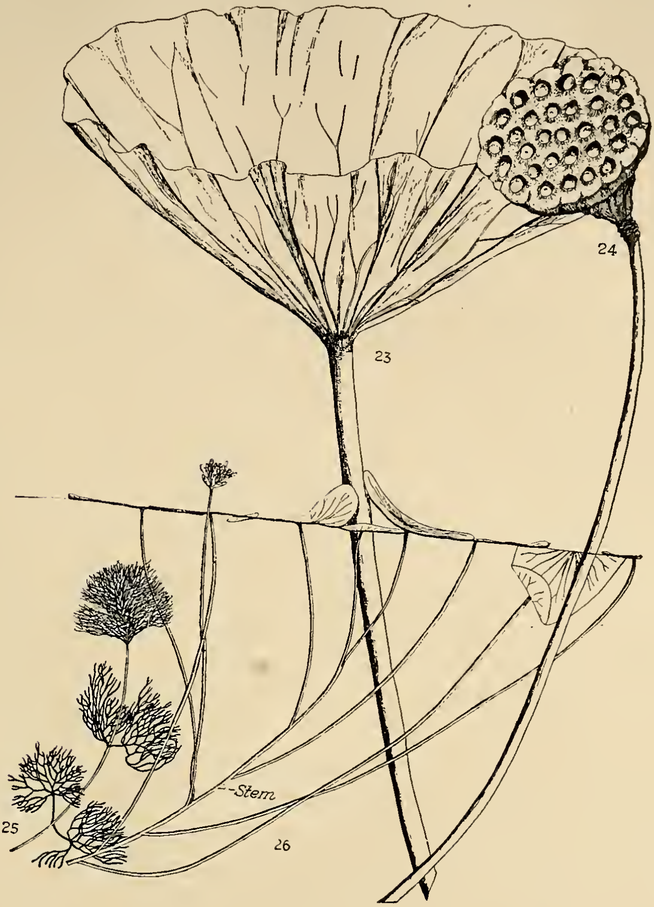


Figure 25. Underwater foliage of **Cabomba caroliniana**, usually known locally as "Water Moss." The small, usually white, (sometimes deep pink) flowers emerge conspicuously above the water. This valuable plant provides oxygen and shelter for fish life and fish food organisms. Occasionally, as in Chicot Lake, it may become over-aboundant and require control.

Figure 26. The Water Shield, **Braseina Schreberi.** Floating leaves, bright green above, lovely red below. Underwater plant parts covered with thick transparent gelatin. Small, un-water-lily-like emerges and is conspicuous green and brown. Good food for ducks but a bad plant for fishing lakes.

Figures 23. Leaf of American Lotus, **Nelumbo pentapetala.**

Figure 24. Characteristic fruit of American Lutus showing large seeds. The leaves stand above the water when young, later float and lack the usual water lily leaf cleft. This plant will completely destroy the usefulness of water areas for fishing and waterfowl. (Copyright illustration from "Fasset," "A Manual of Acquatic Plants" by permission of McGraw-Hill Book Company, Inc., New York and London.)

bers of the water lily family are peculiarly objectionable when they become over abundant in fishing lakes. Their presence can completely ruin a lake for any fishing use within a period of only a year or even less.

The first of these plant pests is the American lotus (Nelumbo lutea) known locally in Louisiana as the Yonkapin or Nienock. It is readily identified by the fact that it possesses very broad, circular leaves which first stand above the surface of the water and as the plant grows older come to float on the water surface. These leaves which, unlike those of the ordinary white water lily (Nymphaea odorata), have no cleft and possess a wax-covered surface so that drops of water on the leaves give the appearance of mercury. American lotus has a yellowish, ten inch in diameter flower of great beauty. The fruit bodies are flattened, conical structures containing nut-like seeds and in general give the appearance of the top of a sprinkling can. American lotus can grow so rapidly that in a single season one plant can produce a circular patch one hundred and sixty feet across. The large flat leaves not only block out growth of all underwater plants, useful as food or shelter for game and commercial fish or for the organisms which form the food-chain of game and commercial fish but they also prevent the aerating action of surface waves. Since they form long underground horizontal structures capable of producing new plants at intervals, the American lotus was formerly peculiarly difficult to control. Experiments conducted under the direction of the Chief Biologist have shown that the cutting of this plant by means of a machine known as the Hocknoye underwater weed cutter only two or three times before the fruits are formed serves to starve the plants storage capacity so completely that the whole plant will die. The machine however, rather costly (about $400.00), is capable when operated by one man of cutting eight acres a day. More recently experiments conducted in relation to the water hyacinth control program have successfully established that the American lotus is readily controlled by dusting or spraying with compounds of the plant killer (harmless to man and to domestic animals) known as 2,4-Dichlorphenoxyacetic acid). The American lotus leaves begin to show the effect of fatal damage within a matter of hours and the plant itself transports the 2,4-D to and destroys the farthest root tips. The department will be very glad to provide anyone troubled with this plant pest with the available directions for getting rid of it simply and economically.

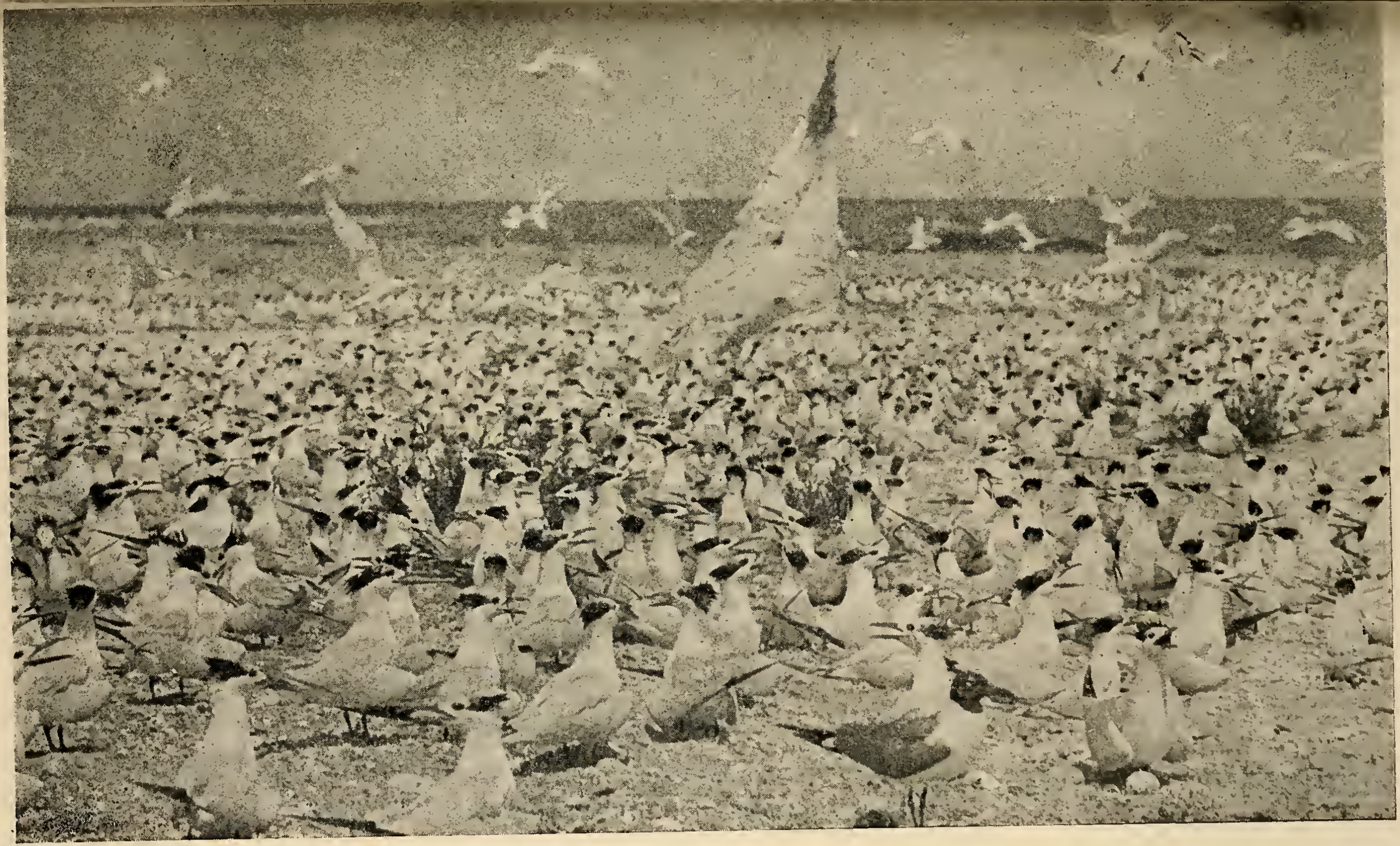
The Water shield (Brasenia schreberi), second lily-like, plant-pest, is a strange aquatic floating plant with oval, olive green floating leaves, possessing no cleft and with the under surface of the leaves and other underwater structures coated with a thick, conspicuous, transparent layer of jelly-like slime. The under sides of the leaves are bright reddish. Water shield destroys fishing usefulness of lakes in the same way as does American lotus, namely by blocking out light and destroying essential submerged plants and fish food-chains. It spreads rapidly from long horizontal stem-like structures. Unlike the other two plant pests here discussed, water shield is useful as a duck food since its completely un-lily-like blossoms produce small greenish and reddish fruits sought particularly by the surface feeding ducks since these fruits float. Control of water shield was in our experimental investigations, to be readily accomplished either by underwater cutting and subsequent starvation of the plant or by use of 2,4-D chemicals.

Third member of the water lily family found to be so destructive of fishing use of lakes is completely unlike a water lily in appearance although it is a member of that family. Commonly called (like many other plants) simply "water moss", it is perhaps just as easily known by its technical name, Cabomba (Cabomba caroliniana) as by any other name. Like several other "water mosses" that often occur in the same lake, Cabomba is a submerged water plant producing only tiny five or six petaled blossoms usually white, sometimes pink, above the water surface. Cabomba's luxuriant growth can so completely fill a lake that fishing is impossible due chiefly to two causes. First, dense growths of Cabomba afford such ideal habitat for fish food organisms that the well fed game fish do not bother to take bait. Second, growing often from as deeply as eight feet, the long waving fronds of the Cabomba snarl up any fisherman's lure and tackle in spite of weed guards. Our experiments up to the present have indicated that lowering the water level of lakes (as is readily possible in impounded waters) during the winter destroys marginal Cabomba and reduces greatly the trouble it causes. However, indications are that even this submerged plant can be in high measure controlled also by 2,4-D which is itself harmless to fish and to fish food in the concentrations used. Carefully planned observations on each of these controlled techniques have been completed or are in progress and there is every reason to believe that a practical, economical method of Cabomba control available to the owner of private ponds or private lakes, can be worked out even where it is not possible to seasonally greatly lower (de-water) the area involved.

Creel Census Established

A creel census, it is believed the first systematic one in Louisiana, has been established at Lake Chicot in relation with the long term lake management studies being conducted in that area. The creel census provides a method whereby a rough but useful estimate of fishing productivity of a lake can be estimated. Printed, tabular cards are provided fishermen entering the area for recreation and these fishermen are requested to give on such cards information as to number, kinds, etc., of fish, types of bait, weather and other data. It is evident that such a card must be highly simplified and it is also evident that by no means are all such cards filled out. However, over a period of time such a series of questionnaires relating to a single locality provides useful knowledge. Comparative catches reported by a group of chosen individuals will give some measure of the fish productivity available. It is planned to extend this system to other lakes under the jurisdiction of the State Parks Commission where the control of the fishing recreational facilities is well centralized.

When, as now, through increased desire for recreational fishing and increased economic need for more food, the management of private ponds, private lakes and public waters for greater production of game and commercial fish and easier harvesting of these crops, become of high importance to everyone having ownership of or access to fishing facilities.



Photograph by James Nelson Gowanloch

Observations and records of the extraordinarily rich bird life of Louisiana are being maintained by the Division of Fish and Game, as well as by activities cooperative with federal agencies, museums and individual specialists.

The above photograph, taken on a typical breeding ground on one of the Chandelur Islands, shows a colony of Cabot and Royal Terns, together with, in the foreground, a single Laughing Gull, the only species of gull that breeds in Louisiana. The teepee-like object which appears in the center is a photographic blind.

Enquiries

The usual stream of requests for identification of specimens and inquiries covering the widest possible range of matters relating to biological natural resources, continues to be received by the Chief Biologist. Frequently quite extensive search is made to provide information and contacts with interested concerns or individuals where problems involving the development of our Louisiana biological natural resources arise.

Frequently specimens submitted prove to be of considerable scientific interest constituting either new records of occurrence of species in the state or new types of abnormal individual development. Such matters have been transmitted when desirable to the appropriate scientific specialist. It is the objective to co-operate in every possible way with persons interested in obtaining identification of unusual specimens.

Inquiries relating to the possible profits of commercial bullfrog raising still lead all other inquiries, being received in greatly increased numbers particularly from G-I's who believe that with small capital high financial returns can be obtained. It has been the policy of the Chief Biologist invariably to indicate that in spite of fantastic claims made by various individuals or agencies, the successful artificial rearing of bullfrogs in the United States remain still to be proven. To those who still wish to try frog farming, information as to availability of possible breeding stocks is readily provided without, however, recommendation of their success.

Eminent Scientific Visitors

Information from the department has been sought in person by eminent scientists and conservation administrators from many other states and from other lands including France, England, Brazil, the Argentine Republic, Mexico, the Commonwealth of India, the Commonwealth of Australia, the Commonwealth of New Zealand and Great Britain. It is gratifying to note that the work being conducted by the Louisiana Department of Wild Life and Fisheries has evoked such wide attention and commendation.

Participation in State, National and International Conferences

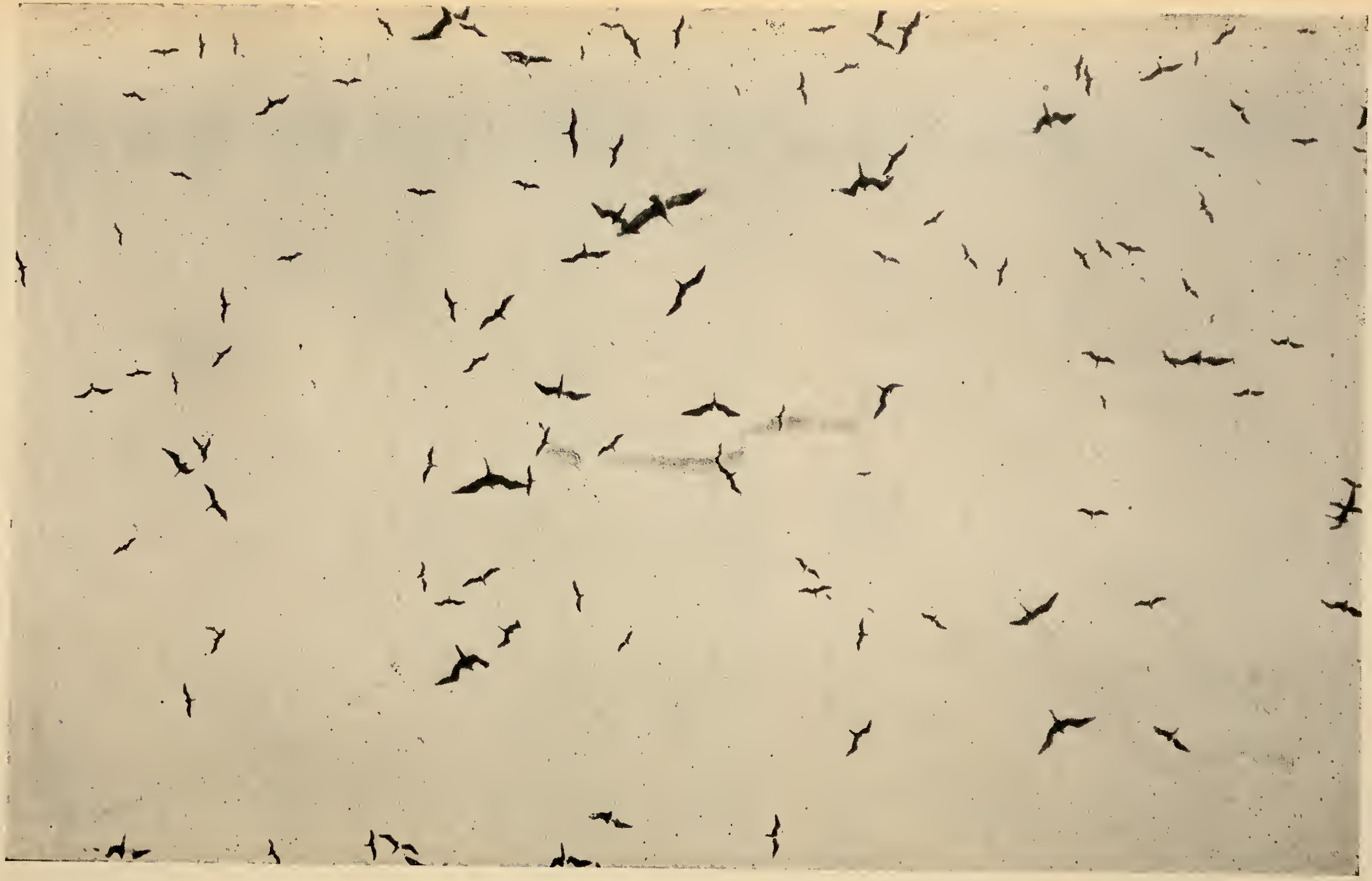
During the biennium, the Chief Biologist participated in various state, national and international organizations particularly those devoted to the scientific study and utilization of natural resources. He served as president of the New Orleans Academy of Science, as secretary and then vice-president of the National Shellfisheries Association, as vice-president and member of the Board of Trustees of the Southern Association of Science and Industry, and presented four papers, elsewhere published, before sessions, during the biennium, of the American Fisheries Society and of the North American Wildlife Conference. The value of these contacts is considerable since interest in the extraordinarily rich resources of the State of Louisiana is constantly increasing both southwide and nationwide.

Numerous addresses were also given before various clubs, institutions of higher education and scientific organization both within and without the State. Requested radio addresses were also given.

The Chief Biologist was called upon to co-operate with the Louisiana Stream Control Commission in the formulation, regulations covering certain fields of pollution problems relating to marine resources, such work requiring conduct of field surveys and other studies.

Special Southern Problems

Regional problems concerning the South are constantly arising and the importance of securing the South's equality is one of the most serious that we face. The Chief Biologist, during the biennium, has participated in various activities directed towards this end. When differential regulations were proposed to control southern interstate commerce in oysters, for example, it was necessary to conduct extensive experimental work to establish the basic scientific data whereby the enactment of unjust and discriminatory regulations could be prevented. It still remains a lamentable fact that the fisheries industries in the South are ill organized and less well schooled in bringing their case before the



Photograph by James Nelson Gowanloch

Illustrative of the ornithological records and observations being conducted by the Division of Fish and Game is this photograph showing a typical concentration of a Man-o'war-birds circling above one of Louisiana's astonishing coastal bird refuges.

Lower, middle center, can be seen an Eastern Brown Pelican.

The camera here is merely directed toward the zenith. Although the Man-o'war-bird nests nowhere in the United States (It breeds in January in the Bahamas) large numbers of this spectacular flyer spend the summer in our state.

public than are the financially greatly more powerful Northeast and North central interests in the competition with which they come into competition. Examples of this constantly arise and it is constantly more compellingly clear that if the South is to attain its just place in the economic pattern, the South must awaken to these repeated situations. As a member of the Board of Trustees, vice-president and permanent Chairman of the Fisheries Committee of the Southern Association of Science and Industry, the Chief Biologist presented in brief summary some of these essential programs for action.

Louisiana fisheries problems have additionally become progressively concerned with international relations, a field of jurisdiction of the Department of State of the Government of the United States. Serving as consultant, the Chief Biologist has spent considerable time in assembling data and participating in conferences and discussions out of which has developed a Gulf States Marine Fisheries Commission, which organization, far from vague or nebulous, provides a mechanism whereby the states bordering on the Gulf of Mexico from and including Florida to and including Texas, can judiciously consider their differences, work out practical and valuable answers and in co-operation with the corresponding Atlantic States Marine Fisheries Commission, and Pacific Fisheries Commission, provide united power in a drive to secure essential objectives. The need of such understanding is well exemplified, for example, in the differences of opinion between Louisiana and Texas and the corresponding differences of opinion between South Carolina and Florida regarding the conduct of the shrimp trawl fishery. It is perfectly clear that co-operative relations with such a neighboring sovereign power as the Republic of Mexico can never be accomplished unless the states among themselves agree upon their own individual and their own collective objectives. Although at first glance this may seem to be a field of thought and controversy apart from such a body as the Louisiana Department of Wild Life and Fisheries, nevertheless, it is equally true that this is a serious responsibility of this department since the success and prosperity of some of our major fisheries depend in the end inevitably upon our arriving at the correct answers.

Factors Altering Louisiana's Coastal Biological Wealth

The following address, delivered by the Chief Biologist before the National Meeting of the American Fisheries Society, presents some aspects of the influences that are constantly affecting and gravely altering the biological conditions of the Louisiana coast in their relation to our marine resources.

CHANGING INFLUENCES AFFECTING LOUISIANA COASTAL RESOURCES

The purpose of this article is to discuss the influences of five factors on five biological resources of Louisiana. These conclusions are based on the speaker's observations and field and laboratory experiments during the seventeen years that he has served as Chief State Biologist. The Louisiana Department of Conservation and the succeeding Louisiana Department of Wild Life and Fisheries.

Coastal Louisiana presents a ecological pattern that is surpassed in interest nowhere in the world. The incredibly vast Mississippi watershed draining 31 states and, in part, two Canadian provinces, funnels its complex influence into the warm waters of the Gulf of Mexico in the approximate center of Louisiana's five hundred miles of coast line. The results are amazing.

Permit that the speaker indicate that the most conservative estimate by Dr. Joel Russell reveals that at least two million tons of silt are brought to and deposited in the lower Mississippi delta every twenty-four hours. This load may rise at times to four million tons in a single year. It is possible to identify positively at New Orleans silt elements that have had their origin in the Yellowstone River. Louisiana is an extraordinary part of the United States. It has an average elevation of 100 feet above sea level with, in its four hundred mile long, fifty mile wide flood plain which we are here discussing, an average of only ten feet above sea level.

Copyrighted photograph courtesy of Albert Dixon Simmons

Constant studies of relationships of aquatic plants to waterfowl and the management of such plants in duck shooting areas are being carried out by the Division of Fish and Game.

The above remarkable photograph, showing a flight of American Widgeon or Baldpate, well indicates how the three bunched birds on the right could provide a triple kill with a single shot.

Immense periods of time and slow but vast changes have formed this funneling of waters into one of the most immense drainage and biological patterns in the world.

Five Louisiana biological resources are here chosen and the measure of effect of five hereinafter enumerated influences will be indicated.

The biological resources:

WATERFOWL—Louisiana provides winter haven for probably fifteen to twenty per cent of all our continental waterfowl population.

THE BLUE CRAB—Louisiana's five hundred miles of coast line support a crab industry that is capable of almost unlimited development beyond its present stage where one hundred thousand pounds of crab meat are produced in one port in one day.

THE OYSTER INDUSTRY—Eight hundred thousand acres of suitable water bottom are available.

THE MUSKRAT INDUSTRY — Louisiana in one-eighth of its area, produced in one year, six and one-half million pelts of the total of thirteen million produced in the United States and Alaska.

THE SHRIMP INDUSTRY—Louisiana provides over 70% of all the shrimp produced in the United States and Alaska—a fishery that in the last prewar year ranked sixth in volume and fourth in value of all the fisheries of the United States and Alaska, and, although unrealized, is one of the great fisheries of the world with a production in Louisiana's coastal waters of as much as one hundred and twenty million pounds in one year.

Now the five factors that are profoundly modifying this pattern:

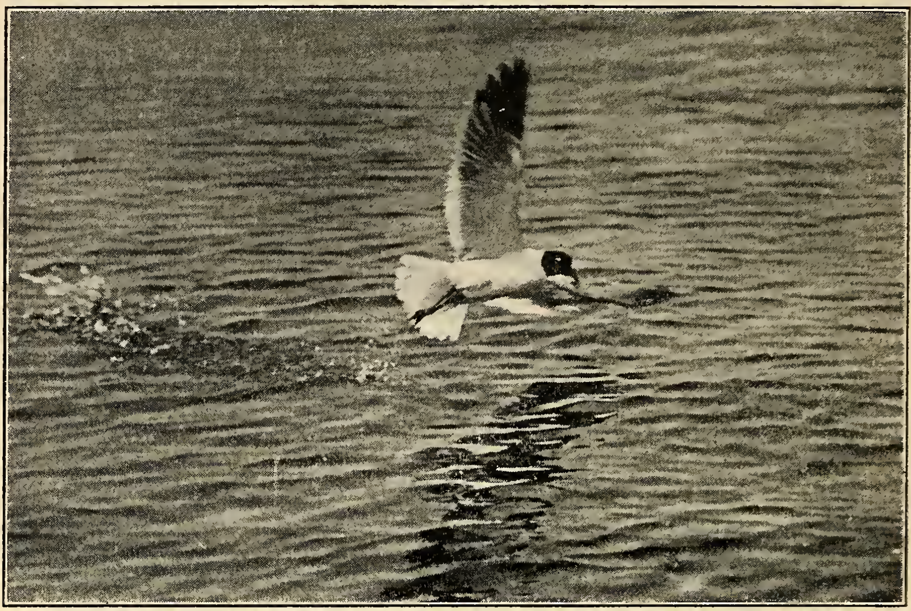
FIRST—Industrial Pollution. This has not yet become heavily damaging. High biochemical oxygen demand water—from sugar mills has local effects—but as hereafter stated, the most dangerous factor could be oil pollution.

SECOND—Lateral navigation canals. The Mississippi drainage in its long geological history, though fluctuating, had some measure of equilibrium—a pattern which although it included tension zones was nevertheless, broadly predictable. Navigation canals are now cut across long established drainage patterns, prevent access of fresh water to oyster beds and crabs and shrimp nursery grounds, make possible

Technical studies in lake management, constituting a complicated long-range program, conducted by the scientists of the Division of Fish and Game, contribute to the success of Louisiana's fishing waters whose use is well indicated above by this photograph of a fishing family, framed in the typical surroundings of a Louisiana cypress grown bayou.

elsewhere disastrous intrusion of sea water into previously stabilized areas, destroying the basic biological patterns.

THIRD—Water Hyacinth. This species, imported from northern South America, has over-run United States throughout the area south of a line drawn from Savannah, Georgia to Los Angeles, California. It impedes navigation, alters drainage patterns and destroys wildlife. Its control and ultimate complete extermination are the objectives of the program we are carrying out. We are using a wide variety of derivatives of 2,4-D Dichlorophenoxyacetic acid. Its ultimate control will cost millions and these costs must be borne by Federal as well as State governments.



The Laughing Gull, Louisiana's only breeding species of gull, is a typical seacoast resident. It must be remembered by fishermen and sportsmen that this bird is fully protected by both state and federal laws.

FOURTH—Oil Development. The discovery of incredibly valuable oil resources in Louisiana's coastal lands and under Louisiana's coastal waters, has greatly affected the biological pattern of these areas. Oil activities come in three stages—exploration, drilling and production. Exploration, involving use of heavy charges of underwater explosives, we have found after exhaustive and costly research, to be relatively harmless. Considerable damage, however, has been caused locally by the construction of canals, permitting invasion by sea water. Drilling operations can be readily controlled. Production operations are dangerous, capable of immense destruction of biological resources through pollution. Their strict and complete control, which is perfectly possible, is imperative.

FIFTH—and last. Flood control. Flood control is necessary to safeguard the lives of thousands of people and to protect unestimated millions of dollars worth of property. Yet these justified flood control activities can wreak immense damage on coastal biological wealth. Permit that the speaker cite one example:

The Bonnet Carre Spillway was constructed to divert some of the waters of the Mississippi River eastward through Lake Pontchartrain and Lake Borgne to the Gulf of Mexico and thus, in times of flood pressure, protect New Orleans. This spillway has been twice used. It was opened in 1937, February 4th to March 16th, for 40 days, with a top discharge of 210,000 cubic feet per second. The results to coastal fisheries were entirely beneficial. The early time of year was greatly significant.

1945 came along, bringing the greatest contained flood in human history. The Bonnet Carre Spillway was opened March 24th to May 17th, for 54 days, with a maximum discharge of 305,000 cubic feet per second. This fresh water, projected over some of the finest oyster beds, destroyed all the oysters in the state of Mississippi and wide areas of oyster beds in Louisiana, east of the river—a loss of oysters, state owned or privately owned—of far in excess of three million dollars, for which loss the U. S. Army Corps of Engineers will accept no financial responsibility whatever.

Such is the changing pattern of Louisiana's coastal lands and coastal waters, the definitive unit in probably the largest drainage and biological pattern in the world. The effects of the impact of these five factors are little realized by the sport fishermen and the commercial fishermen who. in Louisiana, as everywhere else, ascribe poor fishing to near-at-hand, superficially observed, often completely unrelated, phenomena, facts, situations and circumstances, and, in Louisiana, as everywhere else, long wistfully for the good old days.

Seismographic Researches

A further brief section of the Chief Biologist's report relating to seismographic researches concerning effects of dynamite explosions on marine life will be found in the report of the Director of the Division of Oysters and Waterbottoms.

Water Hyacinth Program

A report by the Chief Biologist and Dr. A. D. Bajkov, regarding the technical scientific aspects of the water hyacinth extermination program, appears elsewhere in the report of this division.

Enquiries Answered

The Chief Biologist will be very glad to endeavor to be of assistance at any time to anyone in the identification of specimens or in providing information regarding the development of Louisiana's biological natural resources or in indicating contacts with persons or institutes which will be of aid in the development of such resources.

FUR AND REFUGE DIVISION

ARMAND P. DASPIT, *Director*

The growth of the fur industry in Louisiana, as seen by the Director of the Fur and Refuge Division of the Department of Wild Life and Fisheries over a period of thirty years, seems almost unbelievable. Its development is an outstanding feature of conservation work in this State.

The function of the Fur and Refuge Division of the Department of Wild Life and Fisheries is to supervise all of the State's Game Refuges—Marsh Island, State Wildlife, Rockefeller, St. Tammany, Ayers, Singer, Morehouse and Pass-a-Loutre which approximate 400,000 acres located in widely different areas bordering from the Gulf of Mexico to the Arkansas Line and from St. Tammany Parish to the Sabine River on the Texas border.

In addition to supervision of the game preserves this Division has to supervise the State's $10,000,000 fur industry and to issue all licenses to fur dealers and fur buyers, keep a check on all of their activities, and collect all of the severance taxes due on fur after audits have been made of the fur dealers' books by the State's auditors which approximate $100,000 a year. This tax is turned over to the State.

Efficient personnel is selected to work on the various refuges. The work involves responsibility for managing State game refuges to secure maximum utilization in wildlife production. The areas are developed to produce a maximum of wildlife. This necessitates the supervision of planting and transplanting of proper foods for migratory waterfowl. To do this work we are compelled to employ additional labor and this requires a great many open boats and power boats. The largest refuges are located in the marsh along the Gulf of Mexico in widely scattered and inaccessible areas and are expensive to operate.

During the trapping season we trap the fur bearing animals off the refuges that are destructive to wildlife. This entails quite a bit of work as the superintendents have to select the trappers that are best suited for this work and

Wardens patrolling state game refuges.

then take them out to the refuges and give them camps in which to live and designate the areas they are to trap. These camps must be kept in good condition at all times and it is necessary for us to build on an average of six new camps each year. Three of these refuges are in isolated sections of the State bordering on the Gulf of Mexico and are subject to storms, winds and high tides and for this reason it is necessary to repair many of the camps frequently.

Deep fresh water wells are dug and others reworked so that the wardens and trappers will have fresh drinking water.

Boats are constantly in use on the refuges and require repairs and new parts from time to time.

After the furs are collected by our boatmen and superintendents from the trappers, they are taken to a warehouse that we rent for the trapping season. We arrange this building to suit our purpose for handling and storing furs until they are sold. This entails some expense.

Besides repairing and building new trappers' camps, we have to build wharves and ways for our boats, and maintain them.

The game refuges must be posted and marked. We are therefore required to buy signs and posts on which to place the signs. Due to high winds and storms it is necessary to replace them each year.

Marsh patrolling is difficult and expensive. High powered speed boats are necessary to intercept and arrest law violators. The marsh game preserves are a tempting morsel for all hunters, fishermen and trappers and it is imperative that our men be equipped with the fastest type of boat in order to insure proper protection of the property. On many occasions the airplane is used as a spotter, which also is an expensive proposition.

We frequently have eatouts both by muskrats and blue geese and in order to restore the area with food it is necessary to drain the ponds or small lakes that have been caused by the eatouts in order that the soil may be exposed to the sun so that vegetation will reoccur. For this purpose we have built and used during almost all of the summer months a ditch digging boat which has proven to be very valuable and a money saver. This boat is usually operated by three men.

Heretofore we have been operating exclusively on funds received from the sale of furs plus our accumulated surplus. This surplus has been greatly reduced during the past few years, and due to the decrease in our revenues it is becoming difficult to operate without an appropriation in addition to our present revenues.

It must be remembered that only four of the State's game refuges, which are located in the marshes, are revenue producers, the other four are upland game preserves and do not contribute any financial assistance to this Division. The revenues derived from the marsh refuges are burdened with the expenditures of the upland game preserves.

LOUISIANA'S MOST IMPORTANT FUR-BEARER THE MUSKRAT

While the Northern part of the North American Continent is usually associated in the minds of people of this country as the stronghold of fur-bearing wild animals that are systematically trapped for their pelts, it is nevertheless a fact that the South is important in the fur-bearing animal market, particularly the State of Louisiana which holds the record among states of the Union for producing more commercial pelts than any other state in the Union. This is because of the immense number of muskrats taken by the trappers, the numbers reaching six to eight million skins annually. It is this immense catch of small mammals of the marsh lands that gives Louisiana first place in the number of muskrat pelts taken.

Those seemingly vast expanses of waste marshland lying in the wild grasses and reeds of the lower trapping parishes of Louisiana, criss-crossed by a network of bayous and studded by lakes, are paradoxical abodes of wealth for the natives.

In addition to forming a sportsman's paradise, where migratory waterfowl spend the winter, the coastal parishes of several million acres furnish a potential production of 6,000,000 to 8,000,000 muskrats, whose "belly skins" used by the garment manufacturers, are turned into the gleaming "silver muskrat" coat.

No part of a muskrat pelt is wasted by the manufacturer. It is divided into three parts, the back of the animal is a dark brownish-black, the sides are a reddish or golden tint and the "bellies" are a whitish or silver fur. The garment manufacturers for the past several years have been dying the muskrat pelts to resemble sable and mink. This has proven very satisfactory to milady, who cannot afford to buy the real furs and is glad to have a substitute. The trimmings from the muskrat pelts are used for making a very good grade of felt hats.

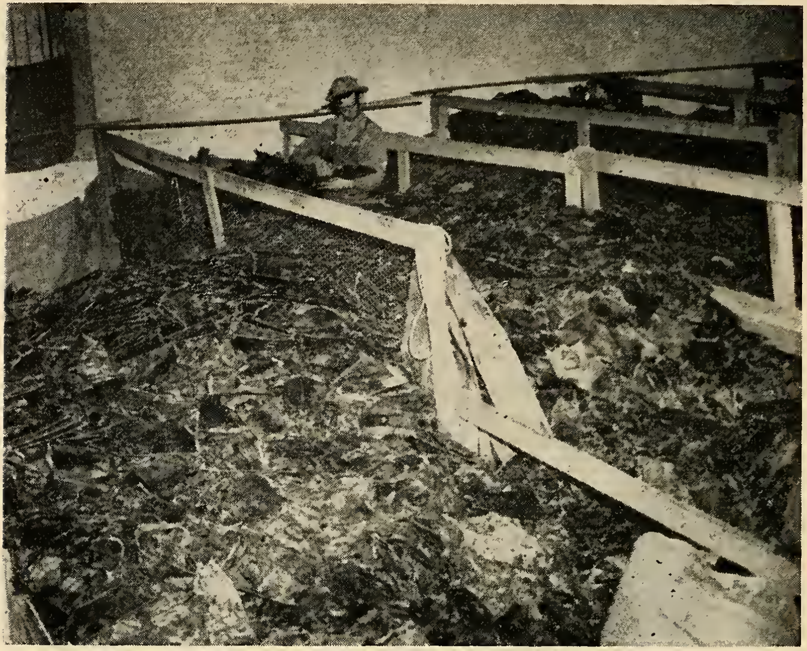
The muskrat is polygamous, thrifty and prolific, in spite of floods, tides and the 250 traps the law allows to each of the 12,000 native trappers in the open season. His

Removing muskrat from trap.

tribe survives and continues to furnish a living for nearly 100,000 persons directly or indirectly connected with the Louisiana fur industry.

The Louisiana trapping industry, reserved by State law exclusively for natives of the old Acadian country, normally brings in $10,000,000 annually for the trappers.

The business is all on a cash basis. The trappers make daily rounds of their traps by pirogue, skin the rats and stretch the pelts, while fur buyers in gasoline boats tour the trapping posts from the New Orleans base and transact their business with the trappers.



State owned furs in New Iberia warehouse awaiting auction.

The buyer in turn brings the pelts to the dealer, who is located in New Orleans. The dealer, having accumulated a great variety of furs, begins to sort them out or grade them according to their respective grades and species. They are then baled and either disposed of promptly or put in storage until the Summer, when there is a demand for pelts to be made into Winter coats.

A well-equipped trapper must have at least a good, steady, well-built gasoline boat of the lugger type propelled by a good, strong, sturdy engine. The boats are usually made of cypress lumber. He should also have in his possession several hundred traps and several hundred stretchers, besides the usual boat equipment. A well-equipped trapping outfit will cost between $2,000 and $3,000.

Most of the trappers during the Spring and Summer trawl for shrimp or seine for commercial fish. The boat is thus almost constantly used by the trapper and can be considered his second home.

While the muskrat furnishes the backbone of this ancient and thriving Louisiana industry, nutria, raccoon, mink, opossum, skunk and otter also flourish their fancy hides in the wake of the Acadian trapper, who scoffs at the tides and laughs at the bogs.

THE NUTRIA OR COYPU

On October 11th, 1930, I received a bulletin from Mr. G. Muller of Buenos Aires offering to this Department South American Nutria.

I immediately took up the matter with Mr. Edward A. McIlhenny, who is always interested in Louisiana's natural resources and development, and he promptly procured several pairs and experimented with them on Avery Island. The colony soon grew very large and were liberated in the marshes. Whereas the Nutria or Coypu is in its infancy in Louisiana, I am firmly convinced that it will, in time, equal in value the muskrat production in this State.

The Nutria or Coypu loves the marshes and it thrives there and, strange to say, does not interfere in any way with the muskrat production, as the food required by the Nutria is entirely different from that of the Muskrat. In other words there is plenty place in our marshes for both species, as the nutria prefer fresh-water marshes over brackish or salt-water marshes, with the reverse being true for muskrats, the result is that there will not be much direct competition between these two fur-bearers in Louisiana.

Whereas some effort was made by Captain Henry C. Brote in 1933 to develop a colony of nutria in and around Covington, St. Tammany Parish, his efforts to populate that section of the country with nutria were never realized. A great many were released by Captain Brote but this office has never heard of nutria being taken east of the Mississippi River. Their habitat seems to be in Iberia, Vermilion and Cameron Parishes. These nutrias were imported and bred by Mr. E. A. McIlhenny, who released them in the marshes in the proximity of Avery Island. A few have been taken as far west as the Sabine River and east as far as the Parish of Lafourche. Last year's take of nutrias was 18,015 and they were trapped in the vicinity south of Avery Island. The nutria seems to be on the increase as only 8,784 were taken in the 1945-1946 Season.

Nutrias are entirely vegetarian and under natural conditions feed preferably on waterplants, bulbs, roots, etc. They are successfully raised and will propagate in pens under equal conditions as rabbits in modern outdoor breeding establishments. In contrast to the rabbit, the nutria prefers dampness, moisture and shade and needs protection from strong sunshine.

These animals can be grown very easily in pens and thrive on any kind of grain or garden truck or garden tubers, with the exception of white potatoes. They like beets, sweet potatoes, carrots, cabbage, turnips and grain of all kinds, as well as freshly cut alfalfa hay. They pasture where they can get sufficient green grass. They need no other food; they eat the same food the year round. It is not necessary for the nutria to have water to swim in.

Nutrias will thrive in a small enclosure, providing they have an abundance of water for drinking purposes. It is not necessary for the water contents to be sufficient for swimming, although a small tank in which they can submerge is advisable, if practicable.

Nutrias have powerful teeth, and will cut out of any wood enclosing them, unless the wood is protected on the inside by wire-screen. They will cut the light poultry netting, but will not cut heavy poultry netting. Two-inch mesh netting should be used for protecting the wood on the inside. Unless the pen in which they are enclosed has a floor through which they cannot dig, the enclosure should be sunk at least 2½ feet, preferably 3 ft., into the ground.

The pen in which Mr. E. A. McIlhenny, Avery Island, La., raises nutrias is large, covering about thirty-five acres of ordinary marsh, with holes dug in it, in which there is a constant supply of water. The fence surrounding the nutria enclosure is sunk three feet into the ground, and extends for four feet above the ground, and is wood with wire-covering. The wire-covering, however, does not reach the top of the fence, as Nutrias climb where they have a mesh in which they can get a foothold. They cannot climb up a plank; nor will they cut through a plank unless their hind feet are on the ground.

Nutrias should have, if kept in a small enclosure, a retreat in which they can retire out of the sun, and this retreat should have an abundance of hay in which the animals can hide.

In the ordinary course one male is sufficient for several females, however, they can also be bred in pairs. Males should never be kept together, except when young up to the age of three months. The Female is somewhat smaller than the Male and has the peculiar distinction of being the only animal with its breasts in the back instead of on the belly. These animals raise two litters a year. The litters average from four to eight young. The young breed at six months so the increase is rapid. They mature between six and nine months.

The period of gestation is about 90 days. In general breeding, mating and handling of the animals is entirely similar to rabbits. Careful observation and study of the animals and their habits will soon give expert knowledge of handling and caring for them to anyone accustomed to breeding rabbits or other fur-bearers.

It is generally considered that the raising of Nutrias is much more lucrative and less hazardous than that of rabbits, muskrats, beavers or other fur-bearers.

THE MINK

Louisiana leads all other states in the Union in the production of mink pelts. Aside from otter skins, the pelt of the mink is the most valuable fur taken in our State. It occurs throughout Louisiana, being found in greater numbers, however, in heavily wooded water-bottoms and in cypress and tupelo swamps. The mink found in these sections are more valuable than those inhabiting the coastal marshes as the "woods mink" has a darker coat and the fur is finer.

The leading mink-producing parishes, in the order of their importance in numerical production, are: Terrebonne, St. Mary, Lafourche, Cameron, Vermilion, Assumption,

Counting and packing furs in camp on Marsh Island prepatory to shipping to New Iberia warehouse.

Plaquemines, Calcasieu, Jefferson, Livingston, Tangipahoa, Natchitoches, DeSoto, Iberville, Rapides, Bossier, Caddo, Richland, St. John, St. James and there is not a parish in the State where this fur animal is not taken.

THE RACCOON

The raccoon is a valuable fur animal and is of uniform distribution throughout the State. It is as plentiful in the marshes as it is in the vast hardwood lands and the cypress and tupelo swamps. The Marsh animal is known to the trade as "Louisiana tidewater" or "salt water" 'coon, and is reddish or yellowish as compared to the darker inhabitants of the wooded swamps. The darker raccoon brings a much better price than does the marsh animal.

The raccoon is a thickly built animal with a coat of long, rather coarse, greyish-brown hairs, black at the tips, underlain by a fine fur characterized by its length, softness and thickness; it has short ears, and a bushy black-and-white ringed tail. It averages 32 inches in length and possesses a long, pointed snout, and a white face with a characteristic black area on each cheek surrounding the eye.

The raccoon pelt is used today extensively in the manufacture of coats for both men and women. It is a splendid wearing fur and very warm and comfortable.

THE OPOSSUM

The opossum is prized first for its fur and second for its flesh; especially among the colored folk 'possum and sweet potatoes is considered a choice dish.

The pelt of the oposum is used mostly for trimming.

The opossum is distributed generally throughout the State, being found in numbers in every one of the sixty-four parishes, including Orleans. It seems to center in greatest numbers in Terrebonne, Lafourche, Calcasieu, Jefferson, Natchitoches, Plaquemines, Beauregard, Assumption, Rapides and Allen.

THE SKUNK

Louisiana does not produce as many skunk pelts as the more northern and eastern commonwealths. The take has fallen off considerably in the past few years. An average of from 10,000 to 12,000 pelts were taken in the past two seasons.

The common skunk is found and trapped in every parish of the State, Terrebone, St. Mary, Lafourche, Livingston, Cameron, Caddo, Claiborne, Plaquemines, Richland, Pointe Coupee, Natchitoches, Rapides, Tangipahoa, Vermilion, St. John and St. James being the leaders in the order named.

THE OTTER

The Otter is a carnivorous aquatic mammal belonging to the Lutrine section of the Mustelidae family, a group that includes the minks, weasels, skunks, badger and marten. It has a long, slender body, very short legs, stout, tapering tail, and a flattened head. The otter is not only the largest truly fur animal in our fauna, but has a pelt that commands the highest individual price.

A fair sized Louisiana alligator.

THE ALLIGATOR

The Louisiana alligator has been very popular because of the demand for ladies alligator bags, shoes, belts, wallets, suitcases, etc. The Louisiana alligator skin is more preferable because of the absence of the "corn marks" that are found on the Florida and Mexican skins; it is more pliable, and the scales are more artistically curved and shaped.

Only the "bellyskin" is used. The skin is removed soon after the killing, as putrefaction sets in almost immediately in our warm climate, and the value of the skin is depreciated. The "bellyskin" is removed by two longitudinal incisions just below the horny portion of the back; and the flesh side of the skin thoroughly rubbed with salt and rolled up with the salted side inside, and shipped to the market. Care is taken not to cut the hide since small cuts not noticed in the raw skins become conspicuous when it is tanned and dressed. Louisiana skins obtain the highest price in the market and those from Florida the lowest.

COMPARATIVE TAKES OF ALLIGATORS IN LOUISIANA

Season	Less Than 5 Feet	Less Than 10 Feet	More Than 10 Feet
1945-1946	17,136	5,476	62
1946-1947	26,165	7,181	63

Below is listed the comparative takes of fur animals in Louisiana and the approximate value at point of severance in the 1945-1946 and 1946-1947 seasons:

1945-1946 Season

Muskrat	8,337,411	@	$ 1.50	$12,506,116.50
Nutria	8,784	@	5.00	43,920.00
Mink	168,598	@	15.00	2,528,970.00
Raccoon	244,502	@	1.50	366,753.00
Opossum	90,433	@	.50	45,216.50
Otter	2,367	@	20.00	47,340.00
Skunks	12,224	@	1.00	12,224.00
Fox	3,823	@	.50	1,911.50
Cat	1,430	@	.50	715.00
Miscellaneous	37	@	.50	18.50
Total:	8,869,609			$15,553,185.00

1946-1947 Season

Muskrat	8,029,764	@	$ 1.00	$ 8,029,764.00
Nutria	18,015	@	3.00	54,045.00
Mink	153,027	@	5.00	765,135.00
Raccoon	186,750	@	1.50	280,125.00
Opossum	77,264	@	.60	46,358.40
Otter	2,832	@	12.50	35,400.00
Skunk	4,830	@	.50	2,415.00
Fox	2,645	@	.50	1,322.50
Cat	383	@	.50	191.50
Miscellaneous	53	@	.50	26.50
Total:	8,475,563			$ 9,214,782.90

REVENUES RECEIVED IN THE FUR AND REFUGE DIVISION IN THE 1945-1946 SEASON

Resident Fur Dealer's Licenses	44	@	$ 150.00	$ 6,600.00
Non-Resident Dealer's Licenses	3	@	300.00	900.00
Resident Fur Buyer's Licenses	364	@	25.00	9,100.00
Non - Resident Fur Buyer's Licenses	4	@	100.00	400.00
Trappers License Net	11,180	@	2.00	20,908.73
(less sheriffs' commission)				
Total amount of tax collected from Fur Dealers and Fur Trappers				79,024.15
Dividends from Defunct Banks				904.96
Game Warden Services				2,606.17
Total				$120,444.01
Total Revenues received from the sale of furs taken from the State Game Refuges, Marsh Island, State Wildlife and the Rockefeller Refuges.				
Total amount of fur sales			$239,077.24	
Less Trappers' 65%			155,404.35	
Department's 35%				$ 83,673.69
Department's 35% of revenues received from the sale of furs taken from the St. Tammany Game Refuge				722.81
Department's 25% of revenues received from the sale of furs taken from the Pass-a-Loutre Refuge				624.41
Sale of Confiscated Furs				150.62
Department's 25% of revenue received from the sale of alligators taken off Marsh Island				693.69
Department's 25% of revenue received from the sale of alligators taken off Rockefeller Refuge				177.49
Revenue received from Pasturage on the State Game Refuges				1,295.75
Total				$ 87,338.46
Grand Total				$207,782.47

REVENUES RECEIVED IN THE FUR AND REFUGE DIVISION IN THE 1946-1947 SEASON

Resident Fur Dealer's Licenses	45	@	$ 150.00	$ 6,750.00
Non-Resident Dealer's Licenses	2	@	300.00	600.00
Resident Fur Buyer's Licenses	352	@	25.00	8,800.00
Non-Resident Fur Buyer's Licenses	7	@	100.00	700.00
Trapper's Licenses net (less sheriffs' commission)	13020	@	2.00	24,516.00
Total amount of Tax collected from Fur Dealers and Fur Trappers				126,134.60
Game Warden Services				2,096.56
Total				$169,597.16
Total revenues received from the sale of furs taken from the State Game Refuges, Marsh Island, State Wildlife and the Rockefeller Refuges.				
Total amount of fur sales			$181,349.80	
Less Trappers' 65%			117,877.37	
Department's 35%				63,236.12
Department's 35% of revenues received from the sale of furs taken from the Pass-a-Loutre Refuge				2,245.66
Department's 25% of revenues received from the sale of alligators taken off Marsh Island				1,471.23
Department's 25% of revenues received from the sale of alligators taken off Rockefeller Refuge				329.32
Revenue received from Pasturage on the State Game Refuges				2,242.00
Total				$ 69,524.33
Grand Total				$239,121.49

Flight of migratory waterfowl on Marsh Island.

WILDLIFE SANCTUARIES IN LOUISIANA

The largest state-owned Winter Wildlife Sanctuaries in the world are located in Louisiana, and are the first migratory waterfowl refuges to be established and owned by any state or national government.

Located in this State are the following migratory waterfowl refuges:

MARSH ISLAND (Russell Sage Wildlife Refuge) located in Iberia Parish, comprises 79,000 acres.

STATE WILDLIFE REFUGE located in Vermilion Parish, comprises 13,000 acres.

ROCKEFELLER REFUGE located in Cameron and Vermilion Parishes, comprises 86,000 acres.

PASS-A-LOUTRE REFUGE located in Plaquemines Parish and comprises 66,000 acres.

ST. TAMMANY REFUGE located in St. Tammany Parish and comprises 6,000 acres.

Louisiana not only has migratory refuges but has established the following Upland Game Refuges, which

Fresh water well on Marsh Island.

are for the propagation of upland game birds of all descriptions:

SINGER GAME REFUGE is located in Madison Parish and comprises 45,000 acres.

AYRES-FISHER REFUGE is located in Tensas and Madison Parishes and comprises 30,000 acres.

MOREHOUSE GAME REFUGE is located in Morehouse Parish and comprises 58,000 acres.

Our superintendents and wardens patrol these preserves constantly to see that there are no violations and "NO TRESPASS" signs are posted on all the State's game refuges.

The geographic position of Louisiana makes it an important bird state and each year it affords a vast assembling place for great hoards of migratory waterfowl and shorebirds. To protect these yearly visitors from possible extinction has long been the aim of the Department of Wild Life and Fisheries.

Two keeper's cottages and two garage apartments with space for two cars and one for fur storage have been completed on the Rockefeller Refuge, one on the East End and the other on the West End. These buildings add prestige and improve the value of the property.

These cottages permit the superintendent and enforcement agents to live on the property, thereby improving the supervision of the property. Watch towers are to be built at the rear of each cottage for viewing the refuge through field glasses. The location of the cottages will permit the superintendents and enforcement agents to intercept any trespassers and persons engaged in bootlegging of furs by land.

Just as soon as lumber and other materials are available, we intend to build fifteen double trapper's camps and repair all existing camps on the Rockefeller Refuge.

The superintendent's cottages at Firman on the State Wildlife, and Bird Island Bayou on Marsh Island have been repaired and painted. All trapper's camps on these refuges are being repaired.

A requisition was issued for a new superintendent's cottage on Marsh Island but the bids received were entirely out of line so the project has been abandoned for the present.

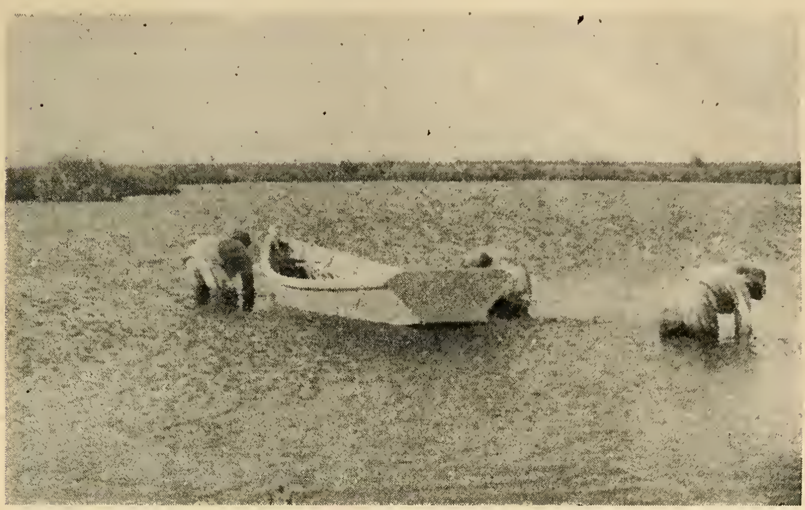
Two additional deep water wells have been added to the property at strategical points in order that our wardens and trappers may be supplied with fresh drinking and cooking water.

It is the intention of this Division to improve these properties from year to year until a maximum has been reached.

DUCK FOOD PLANTING PROGRAM ON STATE'S WILDLIFE GAME PRESERVES

The largest duck food planting project ever attempted in Louisiana has just been completed on the Marsh Island and State Wildlife Refuges.

About 1,000 scattered acres were planted. The planting was late in starting for the reason that the cold weather had retarded the growth of the young plants to be transplanted. It was necessary to wait until the young plants had developed sufficient roots to insure a successful trans-



Crew gathering duck food for replanting.

planting. Our long years of experience have taught us, in order to be assured of successful planting of duck food, it is necessary to transplant only such duck foods as are acclimated to the vicinity where the planting is taking place. In other words it is only the *naturals* that were used in this project. It is well that such a program was adhered to as many of the first plants that were planted are now in full bloom insuring a most successful job.

The Department's boats "Muskrat" and "Mink" and several other boats were used with something like twenty odd men during the entire month of June.

The program was planned and recommended by Armand P. Daspit as a five-year plan. The Department's Biologist, Ted O'Neil, selected the locations and plants to be used, and the planting was done under the direct supervision of Supervisor Warren Jefferson and Field Supervisor R. D. Landry. Funds were provided from the Marsh Island Oil Lease of the Superior Oil Company.

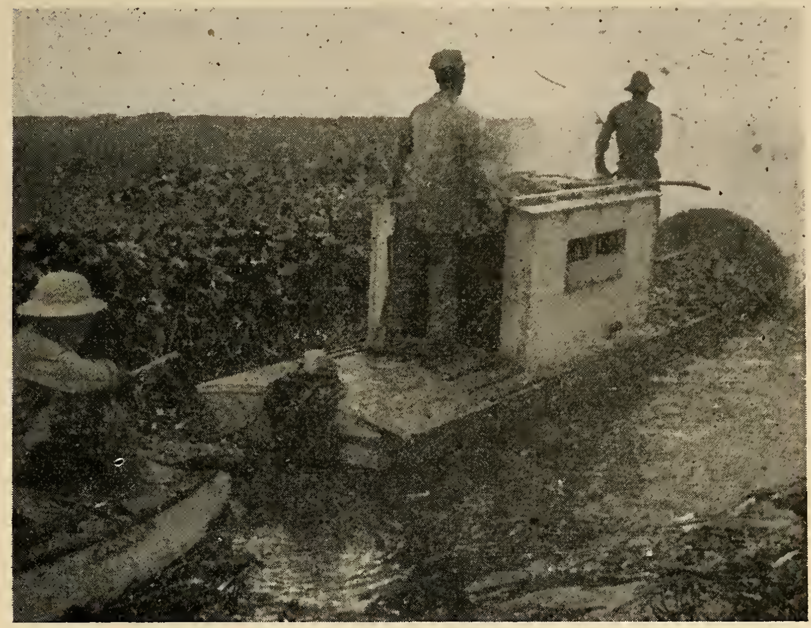
The food plants used were the banana water lily, wild celery, gray duck moss and widgeon grass. Most of the supply of these plants were taken from Firman Lake and One Mile Bayou on the State Wildlife Refuge, and a few

Crew Planting Duck food in Bird Island Lake.

from Nick Lake on the Paul T. Rainey Refuge, from congested areas, and transplanted to North Lake, South Lake, and Red Fish Point on State Wildlife, Bayou Lucien Lakes, Bird Island Bayou Lake, Scatt Lake and other areas on Marsh Island.

DITCH DIGGING BOAT

The Fur and Refuge Division is now operating a ditch digging boat, built under the supervision of Field Supervisor Robert D. Landry. This machine has been used successfully on State Wildlife Refuge in Vermilion Parish and Marsh Island Refuge in Iberia Parish. It is now being used on Pass-a-Loutre Public Shooting Grounds. It is a big money and labor saver, capable of cutting two miles of ditching, four feet wide by two and one-half feet deep, in a day, reducing our cost from $200.00 per mile to approximately $12.00 per mile. It is also doing good work in ridding our patrol ditches and shooting ponds of water hyacinths and alligator grass. Our old method required a crew of ten men for eight days to dig a patrol ditch two miles long. With this machine and a crew of four men we dig a ditch two miles long in one day.



Above is shown the new ditch digging boat now being used by the Fur and Refuge Division on state owned game refuges.

This view shows hyacinths and alligator grass being cleared out of patrol ditches by the new device, which has already proven to be a big money and labor saver.

FUR TRAPPING ON STATE GAME REFUGES

The State of Louisiana, on its vast game preserves, is compelled by law to remove the fur-bearing animals from their property each year in order that the food for the migratory game birds on the preserves will not be eaten up and destroyed.

Just before the trapping season opens, trappers are selected by our Superintendents and they and their families are moved out on the refuges and given trappers' camps in which to live while they are trapping the plot allotted to them by the Superintendent.

Each day when the trapper returns to his camp with his catch for that day, the furs are immediately skinned and stamped while green. All furs taken from the State's game preserves are stamped with an official Department stamp. This identifies the furs with the State and also reduces the possibility of theft.

Our superintendents and wardens patrol these preserves constantly to see that there are no violations while the trappers are on the refuges. The furs trapped are picked up regularly and transported by boat to our warehouse in New Iberia. Our warehouseman counts and grades the furs and piles them in lots.

After the furs are counted and graded, the warehouseman notifies the New Orleans office, who in turn circularizes the entire fur trade advising them of the number of pelts to be sold, the time and place of sale. The furs are sold to the highest bidder for cash.

After the sale, complete information is forwarded to the New Orleans office where tabulations are made and bills prepared for the trappers' portion of the furs sold. The trapper receives 65% and the Department 35%.

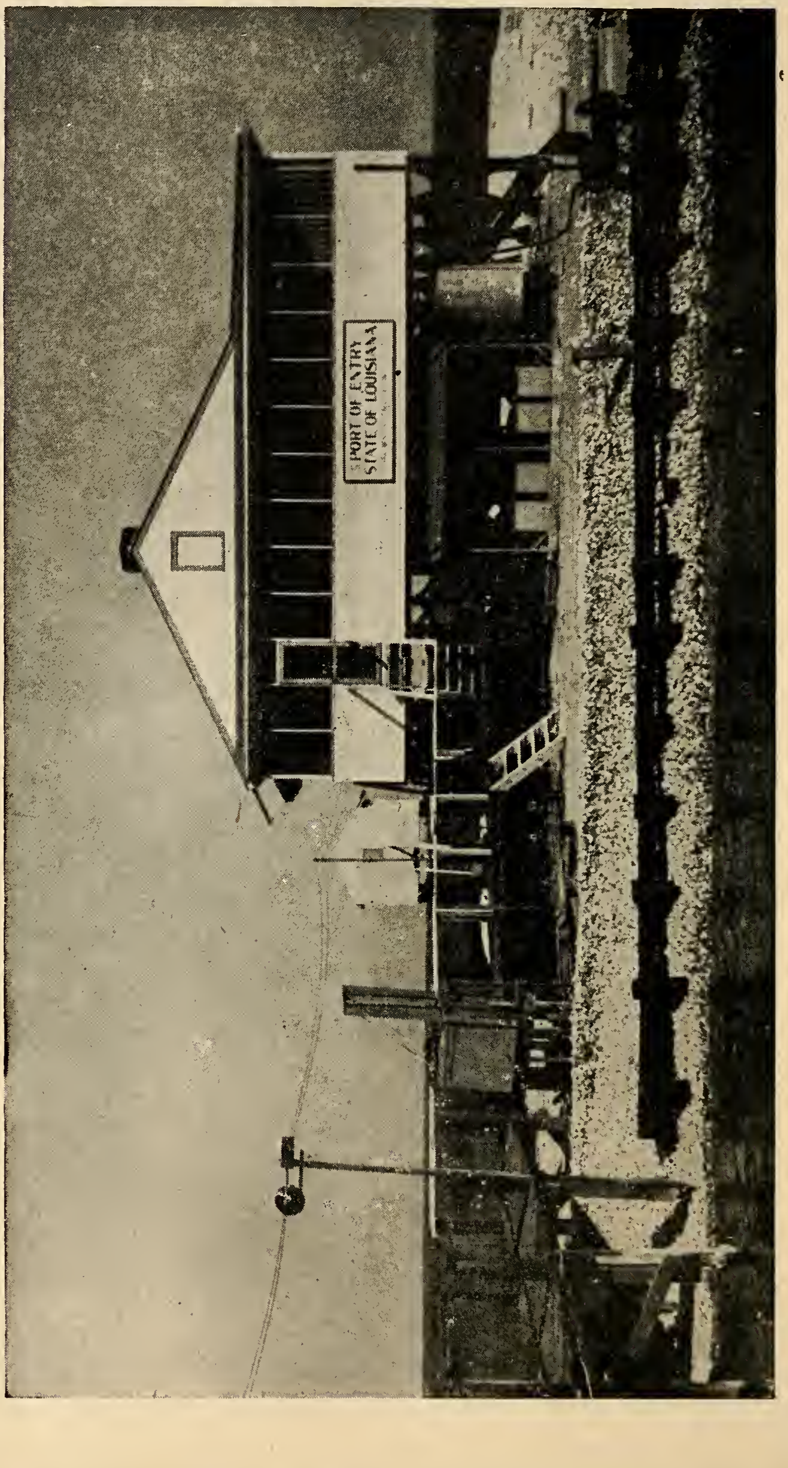
Below is a report of the number of animals taken from Marsh Island, State Widllife, Rockefeller Refuge, Pass-a-Loutre and the St. Tammany Refuge:

1945-1946 SEASON

Refuge	Muskrats	Mice	Mink	Raccoon	Otter	Nutria
Marsh Island...	99,164	1,921	292	796	16	5
State Wildlife..	45,008	1,197	65	351	9	21
Rockefeller	29,527	784	640	609	8	9
Total	173,699	3,902	997	1,756	33	35
Pass-a-Loutre .	1,852	112	...	201	6	..
St. Tammany...	1,672	....	...	....	..	..
Grand Total	177,223	4,014	997	1,957	39	35

1946-1947 SEASON

Refuge	Muskrats	Mice	Mink	Raccoon	Otter	Nutria
Marsh Island...	145,356	4,084	475	995	22	11
State Wildlife..	23,725	1,236	54	135	6	47
Rockefeller	30,499	1,255	870	1,098	7	25
Total	199,580	6,575	1,399	2,228	35	83
Pass-a-Loutre .	6,213	647	1	22	3	..
St. Tammany...			Did not trap			
Grand Total	205,793	7,222	1,400	2,250	38	83



Port of Entry and oyster biological laboratory at Grand Pass before hurricane of September 1947.

DIVISION OF OYSTERS AND WATER BOTTOMS

James N. McConnell, *Director*

A grave emergency faces the oyster industry of Louisiana due to unprecedented oyster mortalities presently occurring in many of the best production areas of the State. Realizing this fact, the main activity of this Division for the past biennium has been to endeavor, first, to ascertain the cause and then to stop if possible the excessively high mortality rate now existing in Louisiana; secondly, to replant new beds and to increase production in areas where normal conditions exist.

Reef Improvement

Reef improvement is a continuous and necessary policy of the Division. For example, to insure that there be a supply of oysters on reefs, the Oyster Division (as authorized by law) requires all factories, corporations, etc., to return to the water bottoms of the State ten (10%) per cent of the shells removed by these concerns when taking oysters from the natural reefs of Louisiana. These shells are necessary as places for attachment for young oysters and when planted in good locations should produce in a period of two years four barrels of mature oysters for each barrel of shells planted.

Shell Planting

A special program of shell planting and rebedding from overcrowded reefs to better locations is being carried on by this Division under a special fund obtained from royalty collected on oyster shells and set aside for this purpose. Several privately owned oyster bedding ground leases in the State Seed Oyster Reservation at Sister Lake have been bought from the lessees at a fair price and returned to the State. A camp and laboratory has been constructed at Sister Lake where a watchman and biologist are stationed. Another watchman's camp is under construction at Lake Felicity to protect State-planted oyster reefs in that area. Permits are issued by this Division to obtain seed oysters from these reservations.

Biological Research

Research is essential, particularly at the present time, for finding the facts necessary for combating the decline in oyster production occurring in the State. The biological staff is now engaged in a program of scientific research designed to secure essential information concerning: (a) Improvements of oyster culture methods; (b) the effect on oysters of oil and sulphur field pollutants; (c) the indirect effect on oysters of seismograph operations; (d) the effect of competitors and predators; (e) the condition of the State oyster seed grounds. This Division now occupies space in the U. S. Fish and Wildlife Service Laboratory at Pensacola, Florida, where critical physiological laboratory work on the oyster is now in progress. The Sister Lake Laboratory is the center for condition studies on oysters. Extensive experimental oyster plantings have been made in the coastal waters of the oyster growing areas. A most important biological experiment on the effects of underwater discharge of seismograph explosives on marine life has been completed. The expenses of this work were borne by this Division. Our investigations furnish the facts which we can use to intelligently protect and foster the oyster industry.

Seismic Operations

Regulations governing seismic operations were formulated in 1939 in cooperation with the various oil companies for the proper protection of oysters, fish, game and furbearing animals. These regulations are rigidly enforced and agents are placed with geophysical crews where necessary. A steady increase in seismic activities is evident. In 1946 an average of sixty agents per month were employed to supervise geophysical operations in areas where damage might occur to the State's natural resources. In 1947 an average of eighty agents were employed each month. The peak of employment in both years was reached in the month of September.

In 1946 the attention of geophysical operators seemed to center in the offshore areas of the Gulf of Mexico. The number of new permits issued amounted to 422, with 35 of these permits issued for outside waters. An additional increase was noted in 1947 when 50 permits of the 378 new permits issued were in the Gulf of Mexico. These figures do not include renewals of permits issued during previous years.

Due to the increase in geophysical exploration and methods of operation, it was necessary in September 1946 to revise our rules governing seismic exploration in Louisiana. For the protection of the fishing interests, the Division has prohibited the detonation of explosive charges placed on the bottoms of all offshore waters. This action was taken because of numerous complaints from shrimp fishermen that the practice of discharging dynamite on waterbottoms leaves craters which have resulted in damage to and losses of shrimp trawls as they are dragged along in shrimping operations. All charges must now be suspended and detonated at a point not below the level midway between the surface of the water and the substratum underlying such water.

Due to the numerous complaints of shrimp fishermen of nets being torn and lost by catching on anchors used in seismic operations, this practice has been discontinued and balloons have been substituted to identify location points.

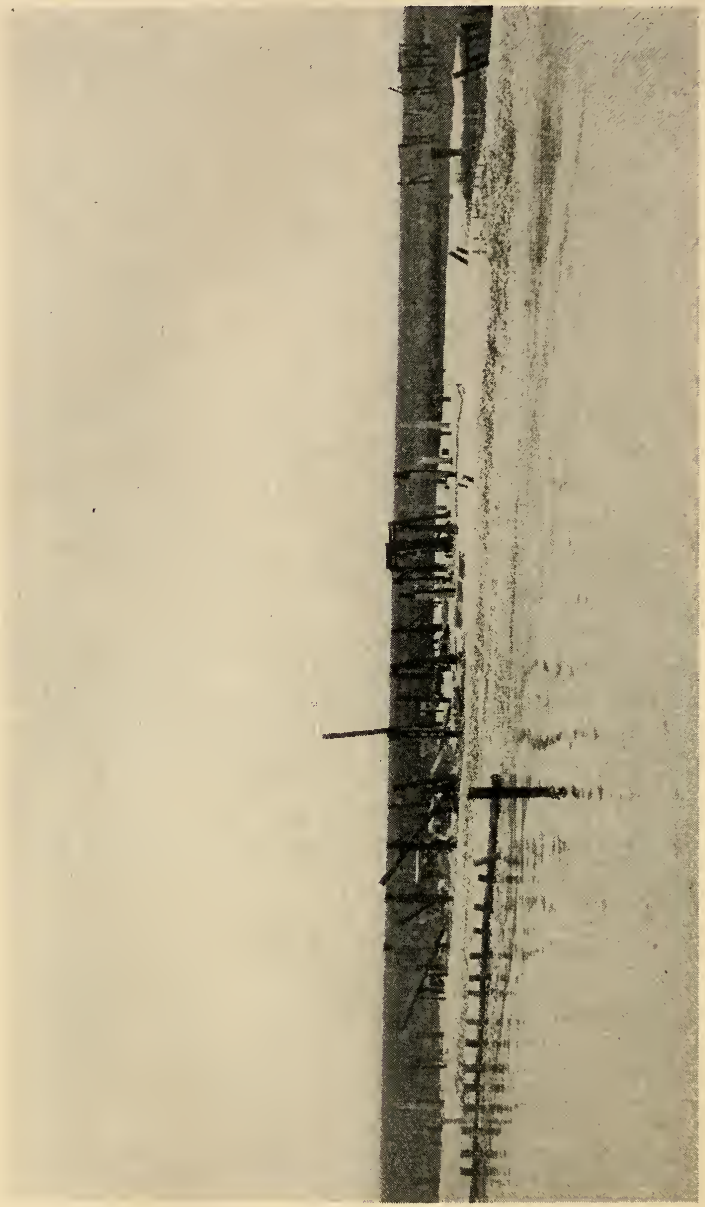
It is the belief of this Division that every effort is being made to properly supervise geophysical operations in the State.

Coastal Waste Control

Due to the heavy increase in oil production in the coastal waters of the State, it became necessary to set up a special Coastal Waste Control Section to inspect and supervise oil production activities to prevent oil waste from contaminating the coastal areas. Two patrol boats constantly patrol these areas to enforce the Stream Control Commission regulations. An airplane is used in coordination with the boats to patrol the coastal waters and locate oil well wastes.

Hurricane Damage

A very heavy loss occurred to this Division when its Port of Entry and laboratory at Grand Pass was com-



View showing total destruction of Grand Pass camp and laboratory after September 1947 hurricane.

pletely destroyed by the September 1947 hurricane. The illustrations show clearly the result of this catastrophe. The loss was estimated at approximately $43,000.00. This was, of course, covered by insurance, but the State's policy on windstorm damage only takes care of fifty per cent of the loss and for that reason it is necessary that this Department request from the Legislature the amount necessary to rebuild this most important Port of Entry and laboratory.

In cooperation with Dr. James B. Engle, of the U. S. Fish and Wildlife Service, the Director made a survey to determine damage to oyster reefs east of the Mississippi river by the hurricane. Widespread damage was found in the vicinity of Half Moon or Grand Isle where many of the reefs were covered by mud and debris and most of the shell plantings in this area were scattered and lost. Much mud and debris were found in the vicinity of Cabbage Reef covering large quantities of oysters. This was also found at the mouth of Deep Water Pass and at the entrance to Grand Pass and in some parts of Cat Island Channel. In Karaho Bay the entire loss of oyster population was noted on about three-fourths of the reefs. Similar conditions were found in Crane Town Bay. Throughout the entire area, however, it was noted that nature was trying to remedy and repair the losses as young spat were found in numerous instances attached to the dead oysters. The reefs where oysters were swept clear due to the force of the waves and tides must be replenished. In California Bay, American Bay, Pumpkin Bay and Bay Seago small areas of reef were covered with mud and debris but the total loss was not found to be as heavy as that in the northern section of the marsh. It is hoped that some assistance from the Federal Government can be obtained to help rehabilitate these reefs.

Oyster Bedding Ground Leases

One of the regular activities of this Division is to lease oyster bedding grounds to private individuals and corporations for oyster cultivation. Applications are filed by the parties interested in leasing grounds, a survey is made of the areas by the Director to determine whether or not such areas are leasable and then a survey is made to determine the amount of acreage involved. A map is made of the bedding ground and acreage determined, the lessee paying one dollar per acre per year as rental. These areas are patrolled regularly both by boat and plane.

New patrol boat "Captain Sandras" built to replace the "Louisiana." Used exclusively for patrolling oyster beds and for collecting biological samples.

Sand, Shells and Gravel

This Division also regulates the taking of sand, shells and gravel from the water bottoms of the State. Leases and permits for these operations are issued and royalties collected.

Collections

Rents for oyster bedding grounds, tonnage and dredging licenses, privilege tax, resale, shipping and shop licenses, and sand, shell and gravel royalties are collected by this Division. The total of these collections averages $150,000.00 annually.

Most of the firms handling oysters turn their monthly reports in regularly and on time. Periodic checks are made in order that these companies not be penalized for reports submitted after the time limits prescribed by law, but in case of delinquency penalties are collected. Mistakes and discrepancies are picked up from time to time when audits are made.

REPORT ON COLLECTIONS
(Fiscal Year)

	1945-1946	1946-1947
Bedding Ground Rental	$ 23,094.00	$ 23,279.00
Privilege Tax	21,488.09	21,481.52
Tonnage Licenses	1,565.50	1,771.00
Dredging Licenses	5,650.00	8,600.00
Shop, Steambox and Resale	1,270.00	1,660.00
Transfer of Leases	31.00	35.00
	$ 53,098.59	$ 56,826.52
Sand	857.69	1,581.93
Gravel	.36	.95
	$ 53,056.64	$ 58,409.40
Shells (under Act 227)	84,902.05	89,576.91
Grand Total of Collections	$138,858.69	$147,986.31

REPORT ON PRODUCTION
(Calendar Year)

Total barrels of oysters taken from Louisiana waters:

	1946	1947
St. Bernard	195,308.75	299,897.75
Plaquemines	220,881.00	135,078.25
Jefferson	18,970.00	20,872.00
Lafourche	7,098.25	22,518.50
Terrebonne	153,856.33	181,486.25
St. Mary	22,514.00	1,406.00
Vermilion	112.50	....
Cameron	2,389.66	....
Total barrels	621,130.49	661,258.75

Total cubic yards of sand, shells and gravel taken from Louisiana waters:

	1946	1947
Sand	131,549.58	119,520.30
Oyster Shells	763,500.71	918,979.84
Clam Shells	724,224.02	954,311.05
Mixed Gravel	14.50	337.00
Total cubic yards	1,619,288.81	1,993,148.19

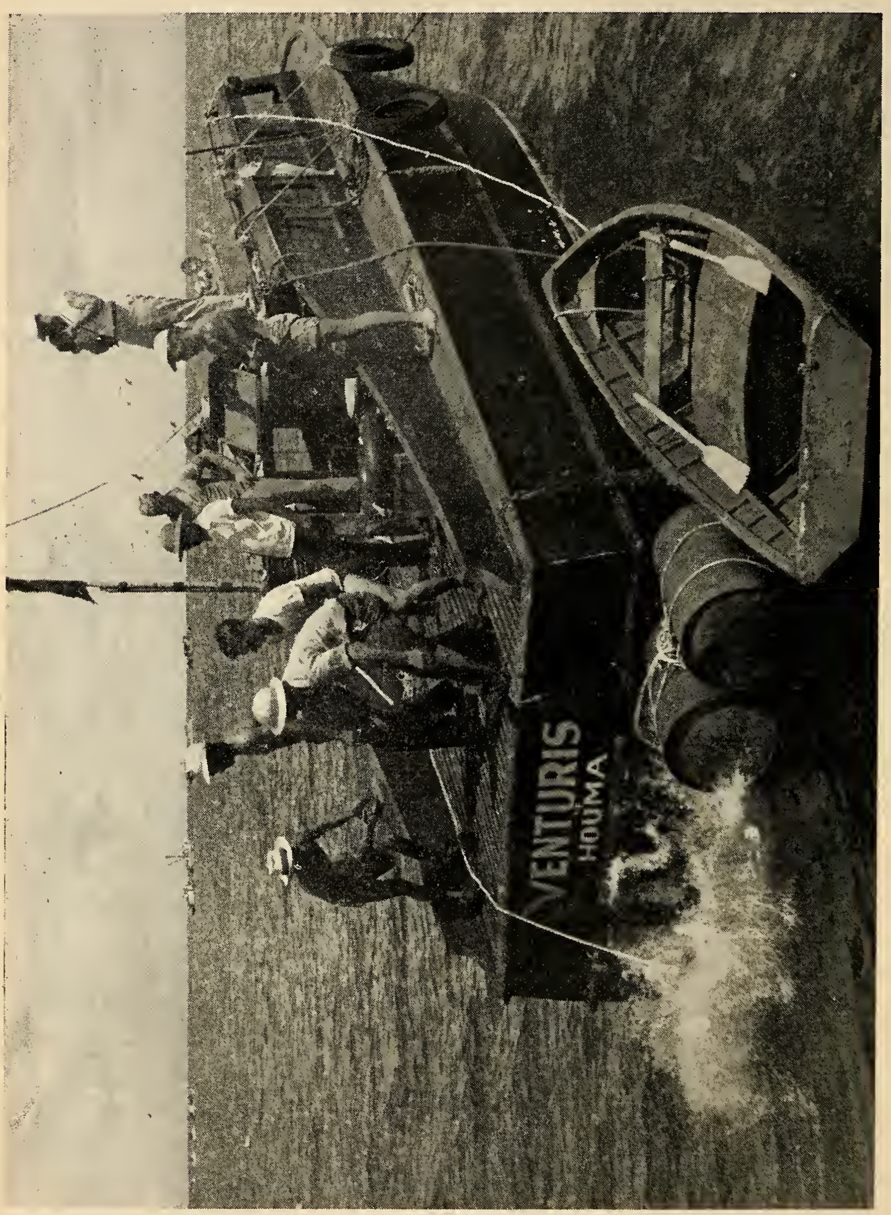
FURTHER SEISMOGRAPHIC DYNAMITE EXPLOSION EXPERIMENTS

Brief Report by

JAMES NELSON GOWANLOCH
Chief Biologist

Results of extensive seismographic experiments covering the effects of underwater dynamite explosion of charges ranging from two and one-half pounds to eight hundred pounds on shrimp, fish (croakers) and oysters were presented in the last biennial report. These carefully controlled researches indicated that a charge, even of the magnitude of eight hundred pounds of dynamite in a single shot, failed to kill fish at two hundred feet, failed to injure the shrimp at fifty feet and failed to affect ascertainable damage to oysters at fifty feet. Certain technical considerations made desirable the conduct of a second extensive series of dynamite experiments devoted to the effects of dynamite charges on oysters when such oysters were integrated parts of oyster beds. These were accomplished utilizing charges of up to four hundred pounds of dynamite fired in the center of oyster beds with the upper end of the dynamite charge only twenty-five feet below the oysters. It was found that such charges not only did not injure the oysters but further did not subsequently damage oysters by release of gasses or other substances from the muds due to the expansion of the explosive shot. Adequate samples of these oysters were removed to large tanks and maintained under observation for a period of two and one-half months and subsequently the beds themselves were reexamined after an interval of two and one-half months and still later up to a period of three years. No appreciable damage to the oysters was found. All of these experiments, rather fully reported in the first biennial report of the Department of Wild Life and Fisheries, were conducted by the Chief Biologist together with John E. McDougall, then Chief Geophysical Inspector of the Division of Oysters and Waterbottoms.

These results were so remarkable and disbelief in them was expressed by the fishermen so generally that Commissioner Luther S. Montgomery instructed the Chief Biologist



Courtesy of Humble Oil and Refining Co.

Charge from shot boat in dynamite experiments. Note fleet of boats in background.

Courtesy of Humble Oil and Refining Co.

Crab cages being lowered into position during dynamite experiments.

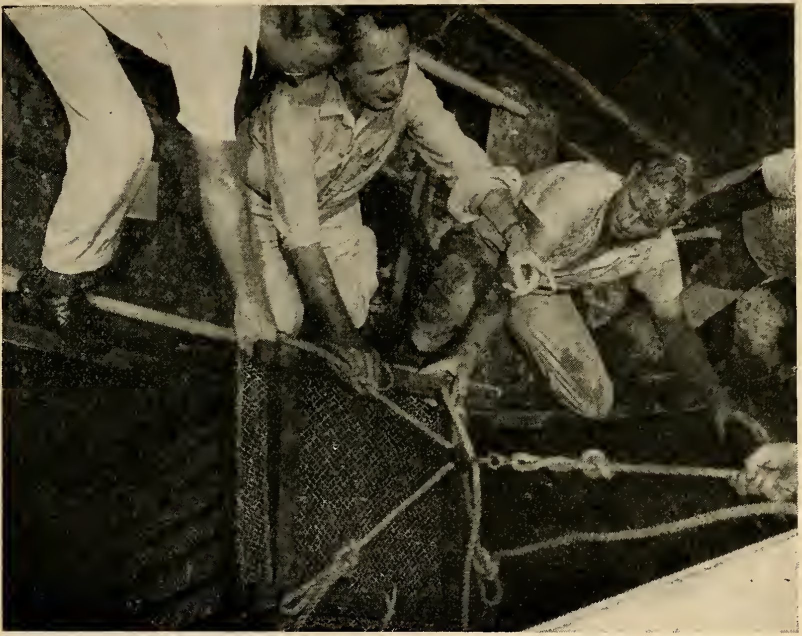
to conduct during the present biennium (Sept., 1947) a third series of experiments using this time fish (croakers) shrimp (common sea shrimp) and the common blue crab. These experiments were carried out jointly by the Chief Biologist and Dr. H. Malcolm Owen, Special Biologist of the Division of Oysters and Waterbottoms, and Louis G. Rodrigue, Jr., Chief Geophysical Inspector of the Division of Oysters and Waterbottoms, using charges ranging up to eight hundred pounds of explosives in a single shot with additional experiments utilizing both suspended and "on bottom" charges of similar size.

The Commissioner invited members of the legislature, representatives of fishing interests, representatives of coastal police juries and any other interested parties to be present to witness the results of these experiments. A full record in colored motion pictures was taken of these experiments and the technical results were presented before appropriate scientific organizations.

Courtesy of Humble Oil and Refining Co.

Examination of crabs after exposure to dynamite charge.

It is perhaps sufficient here to say that although in these experiments fish were killed at a range of two hundred feet, nevertheless the experiments did accord in pattern with the two previous series. The shrimp were completely unharmed at a distance of only fifty feet, while the crabs that were killed by the explosion were found to be individuals that had already bred and would soon normally die. Healthy crabs survived even at a distance of fifty feet from the eight hundred pound charge in spite of the fact that the force of the explosion was so great that it threw the fifty-two gallon drums, used to suspend the charges, three hundred and fifty feet in the air and violently shook boats over one-half mile away. It is significant to note that representatives of the interested groups, fishery industries, police jurors and legislators who had previously been so greatly alarmed about the probable damage wrought by the use of dynamite in seismographic exploration for oil voluntarily came to the Commissioner with the statement that they were now convinced of the correctness of the con-



Courtesy of Humble Oil and Refining Co.

Shrimp and fish cage being raised prior to examination after exposure to 800-pound dynamite charge.

clusions reached in all of these series of experiments, namely, that even dynamite charges of great magnitude, a magnitude never permitted near any oyster resources, caused negligible damage to fisheries.

The Chief Biologist was called shortly later to a special conference at the United States Ordnance Research Laboratory in Washington, D. C., to present the result of these experiments where it was found that they were not only of high value to the Navy in establishing the lack of damage through necessary naval explosive experimentation but they were further found to be in complete accord with the results obtained by the researches conducted by the Navy.

The Chief Biologist later discussed these results with Captain Charles Draeger, U.S.M.C., who had charge of the medical investigations at "Operation Crossroads" at Bikini and found that these results again accorded with his findings.

Main laboratory of U. S. Fish and Wildlife Service, Pensacola, Florida, presently being used by Oyster Division for special oyster research work.

It must therefore, in the light of all these carefully conducted studies be concluded that, in spite of the very general popular opinion otherwise, heavy charges of dynamite produced no economically important damage to our marine resources nor do they drive fish or shrimp away from areas where such exploration by means of explosions is carried out. Damage to shrimp trawl nets may occur due to concrete anchors left behind by seismographic crews but orders issued by Commissioner Montgomery and carried out under his instructions make such abandoning of concrete anchors, which cause such damage, no longer permissible or, since the orders are rigidly carried out, possible.

The Division of Oysters and Waterbottoms exercises the most severe control over the use of explosives of any state. No charge of dynamite however small is permitted to be fired on land or in any coastal waters without the presence of a seismographic inspector who is employed by the Division but whose remuneration although received by him from the Department is paid into the State treasury by the oil company conducting the seismographic work. It is significant that some ninety-five such inspectors are employed by the Division and are hired or fired by the Division and are solely responsible to the Division.

These investigations which attracted national and international attention and the results of which were published nationally and in other lands have been subsequently confirmed by other researches so fully that it is impossible not to accept them as basic statements of facts.

BIOLOGICAL RESEARCH REPORT

By Dr. H. Malcolm Owen, *Special Biologist*

INTRODUCTION

On June 1, 1947, the services of a trained biologist were employed to conduct and direct the necessary investigations relative to determining the cause of the undue oyster mortalities in certain sections of our coastal waters.

This first progress report covers the period from July 1, 1947, when the preparatory work was started, to December 31, 1947. Its primary purpose is to report the organizational work that has been done and the procedures that are now being followed. The results that have been obtained are purposely not incorporated herein because they are incomplete, and it is considered inadvisable to be premature in reporting scientific work before it is thoroughly checked.

Since the time and energies of the Special Biologist have been divided into separate administrative, equipment procural, personnel selection, and data-collecting catagories, this report deals with these and other heads rather than a chronological dissertation of unrelated activities.

A. *Biological Laboratories*

It was evident that part of the scientific problem confronting the Oyster Division was to determine the effect of oil field and sulphur field pollutions on oysters. This required more adequate marine laboratory facilities than those existing in the state on July first.

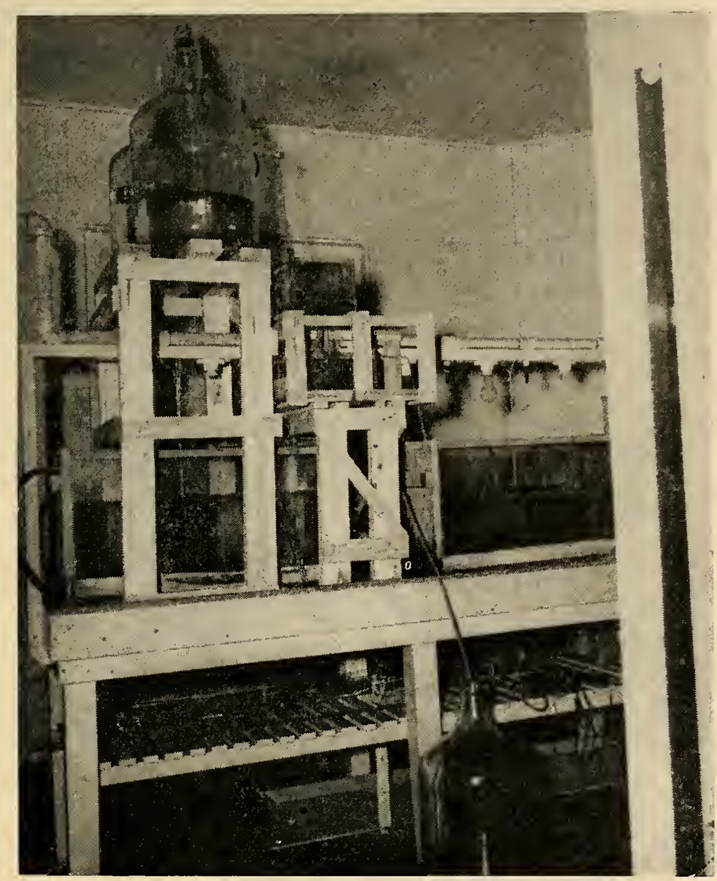
A thorough study was made of marine biological laboratories and the best features of many laboratories were incorporated during the reconditioning of the enlarged Grand Pass Laboratory. It was designed to handle adequately any phase of physiological investigation on the oyster. The hurricane of September 19, 1947, completely washed away the building, taking with it valuable scientific equipment. This loss was covered by insurance.

The U. S. Fish and Wildlife Service Laboratory at Pensacola, Florida, had previously been selected in July, 1947, as the site for duplicating the experiments done in the Grand Pass Laboratory, thereby serving as a control center for the physiological investigations. The program called for the State of Louisiana to occupy space in this laboratory on February 1, 1948. The loss of the Grand Pass Laboratory made it necessary for steps to be taken to receive permission from the Department of the Interior, U. S. Government, to occupy space in the U. S. Laboratory as soon as possible.

The officials of the U. S. Fish and Wildlife Service recognized the need of the State of Louisiana and immediately negotiated a two-year contract effective October 1, 1947.

It is well to report here that this laboratory was kept from complete closure in July because of the efforts of the Director of the Oyster Division in leading the states of Mississippi, Alabama, Florida, Texas and Louisiana to bring to the attention of Congress the discrimination against the Gulf Coast states in the lack of facilities for marine biological research. As a result of this, the Pensacola Laboratory was put on a semi-permanent basis. The Gulf Coast states are now in the process of endeavoring to show to the Congress the need for the full appropriation of money necessary to maintain this laboratory on a full time, permanent basis.

On October 2, 1947, Mr. Robert M. Ingle, Biologist II, was installed in the Pensacola Laboratory and placed in charge of the physiological investigations of the Oyster Research Program.



Oyster experiment at Pensacola laboratory.

Mr. Ingle spent the months of October and November largely in preparation for experimental work. New equipment has been procured, outside tanks have been constructed, living quarters for Louisiana biologists and personnel of the Oyster Division have been reconditioned.

Two sets of apparatus have been designed and devised to detect the heart rate and ciliary activity of oysters. The first of these is based on the principle of sonic amplification, using a U. S. Navy sub-surface microphone. The second is a kinesometer based on the principle of resistance in a closed electrical circuit. Both of these devices are in the experimental stage.

The routine chemical studies of the sea water, pH, dissolved oxygen, salinity, etc., have been in progress since November. It is well to mention here that the necessary chemical analyses of the oyster research program has been made possible by the cooperation of Mr. Frank Coogan, Chemist and Director of the Division of Research and Statistics.

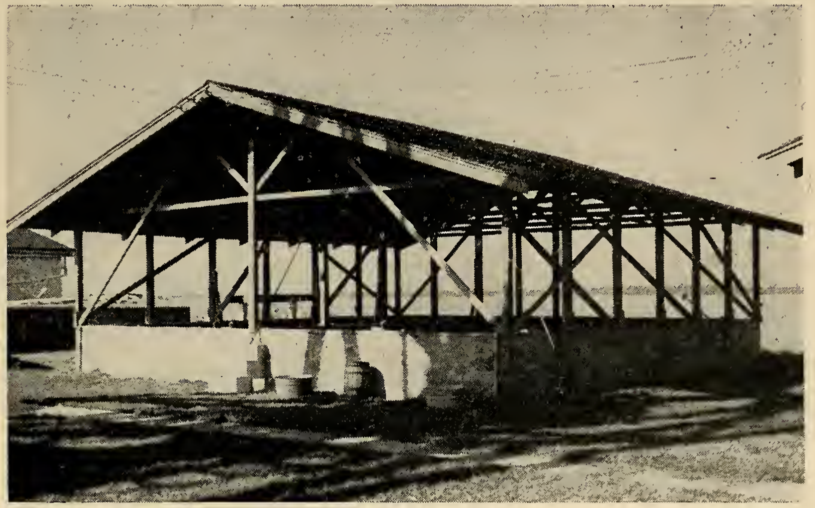
The immediate experiments that are being conducted relative to the oyster mortality problem are those designed to show the influence on oysters of water soluble fractions of oil. (See photographs.) Concurrent with this, procedures are followed that show the quality or "Index of Condition" of oysters at various durations of exposure to the fractions.

Three methods are employed in the experimental physiological work with oysters exposed to water soluble fractions of oil and/or other pollutants, such as bleed water. The first, as illustrated in photographs, allows complete control in introducing the pollution. The second, by the use of large concrete tanks, large numbers of oysters can be exposed and the results handled statistically. The third, the physiological activities within the oyster, e.g. heart rate, ciliary movement, pumping rate and shell movement, are recorded, and deviations from the normal, if any, are noted.

The laboratory at Sister Lake has been completed and is equipped at the present time to serve as a center for the studies on the conditions of Louisiana oysters. Samples of oysters from all sections of the State are flown here within one and one-half hours time. They are immediately tested to determine the quality, or degree, of "fatness" and/or ability to withstand the vicissitudes of the industry and nature. (See photograph.)

B. *Field Experiments*

In order to estimate intelligently the mortality occurring in Louisiana oysters, and in order to make a more thorough study of the Louisiana oyster and oystering under natural conditions, five experimental plantings have been made in various sections of the coastal waters.



Outside oyster experimental tanks at Pensacola laboratory.

On hard reef bottoms, three one-sixteenth of an acre plots have been staked off and seed oysters bedded thereon in concentrations equivalent to those practiced by the industry. Each oyster had been individually marked for later identification. A thorough study had been made of the seed oysters planted. The frequent periodic checks on the oysters in the experimental beds is revealing and will continue to reveal valuable information as to growth, condition, degree of parasitic infection and other information of predators and competitors that will be of value to the oyster industry, as well as pertinent to the immediate problem.

These experimental oyster plantings are located at (1) Grand Pass, (2) Bayou Cook, (3) Bastian Bay, (4) Barataria Bay and (5) Sister Lake.

Several oystermen have cooperated with the scientific work being conducted by the Oyster Division in setting aside sections of their recently bedded oysters for further ecological studies. Such areas are located at Sandy Point, Skipjack Bay, and Bayou Scofield and furnish additional sites in the high mortality area that will enable the scientific personnel to accumulate data from a broader area.

An extensive population study is being conducted in Bayou Scofield through the cooperation of oystermen in that area. Complete hydrographic data, oyster food supply, bottom conditions, and other factors pertaining to oyster growth and culture has been obtained. This type of study which has proven of value to the European oyster culturists will be continued and expanded as time permits.

C. *Seed Area Investigations*

The field studies that have been made during the time covered in this report have centered largely on the State-owned seed areas.

A standard method of sampling was devised which later was recommended to other scientists in this area.

The following seed areas have been studied: Mississippi Sound, Quarantine Bay, California Bay, American Bay, Black Bay and Sister Lake. Separate reports on the mortality occurring among the different aged oysters in each of these areas, the quality of the oysters, the incidence of parasite infection and other pertinent data have been accumulated and is on record for use by the industry.

Fortunately, a large percentage of this study was made prior to the hurricane. After the September storm, the areas were again studied and the storm damage to many individual reefs was computed. This information was placed in the hands of the U. S. Fish and Wildlife Service at their request.

Dr. James B. Engle, Aquatic Biologist of the Fish and Wildlife Service, accompanied by the Director and Special Biologist of the Oyster Division, made a cursory survey which resulted in ascertaining the areas where damage occurred. In all cases, it was found that the shallow reefs and isolated reefs in the lee of low marsh islands were covered with considerable debris.

It is of interest but not of great scientific value to know that the percentage of mortality of the oyster population within the immediate path of the hurricane increased seven per cent.

Outside oyster experimental tanks at Pensacola laboratory (inside view).

D. *Parasites*

Oysters from twenty-six localities have been examined microscopically in order to determine the incidence of parasitic infection. The parasitological studies of the past six months have been confined to the protozoan parasite *Nematopsis* which is found in the encysted stage in the tissue of the oyster and is a definitive parasite of the mud crab.

It is not known whether the parasite is detrimental to Louisiana oysters, although it has been claimed that a high percentage of cysts in the muscle of the oyster physically impairs the contraction of the muscle and thus weakens the oyster making it more susceptible to secondary infections.

The results to date have shown a tremendous variation in the incidence of infection of oysters with *Nematopsis* even on the same reef. In certain areas where the incidence of infection has been found to be high, no correlation can be drawn to excessive mortality.

This parasitological study must be continued until the numbers of oysters examined are sufficiently numerous to be statistically significant.

Field experiments. Plot No. 29. Sister Lake laboratory in background.

E. *Scientific Service to the Industry*

Twenty-two oystermen, all of whom reported excessively high mortality among their bedded oysters, requested examination of their oyster beds during the period between June and December. Eighteen of these requests resulted in the thorough sampling of the beds and a recording of the extent of oyster mortality for the benefit of these men. In some cases, more detailed reports have been prepared covering the ecological conditions of the individual leases. In other cases, reports have been submitted at the request of two disputing parties. The impartial and expert findings of such reports, which have been confined to physical damage by seismic operations, have resulted in settlements without litigation.

Requests for scientific examination of individual oyster leases where mortality is known to occur are welcomed by the Division.

Summary and Conclusions

The Biological Research Program of the Division of Oysters and Water Bottoms has, during the past six months, accomplished the preliminary work necessary for the pursuit of its experimental investigations relative to finding the cause of the excessive mortality of oysters in

Louisiana waters. The staff consists of three trained biologists working under the direction of Dr. H. Malcolm Owen. Other members of the Coastal Waste Control Section have been most cooperative in assisting the staff during the period of acclimatization.

The loss of the Grand Pass Laboratory and especially the equipment has retarded the planned program about ninety days. The preliminary steps for the construction of the new biological laboratory are under way. Because of the urgent need for a modern state oyster laboratory, it is urged that the reconstruction of the Grand Pass Laboratory be given the number one priority during the coming months.

Physiological experiments are now being conducted at the U. S. Fisheries Laboratory at Pensacola, Florida, and the field laboratory at Sister Lake to determine the effects of oil and oil field wastes on oysters. Field experiments are under way at selected sections of the coast.

The future research plans call for (1) an expansion of the field work and a complete correlation of this to the physiological laboratory studies of the effect of oil and bleed water; (2) complete and accurate information on the physical condition of oysters and future population potentialities of the State-owned seed beds; (3) continued collection of hydrographic data over a period of years; (4) continued study on the parasites, predators and competitors of Louisiana oysters; and (5) continued and expanded scientific service to the individual oystermen, especially pertaining to new and improved methods of oyster culture.

Marine resources are not unlimited. The oyster industry is rapidly approaching a precarious condition similar to that in which agriculture found itself fifty years ago. The shrinking industry demands knowledge—knowledge of the constant changes in the ecology of the region, knowledge of changes in industrial practices, knowledge of control of predators and competitors, and knowledge of improved breeding are essentials for progressive, modern aquiculture.

It is the purpose of the Division to continue the program of oyster research which results in the acquisition of knowledge essential for the prevention of critical biological and economic depletion.

Coastal waste inspector preparing to check tank battery installation.

COASTAL WASTE CONTROL REPORT

By G. B. Triplett
Chief Inspector

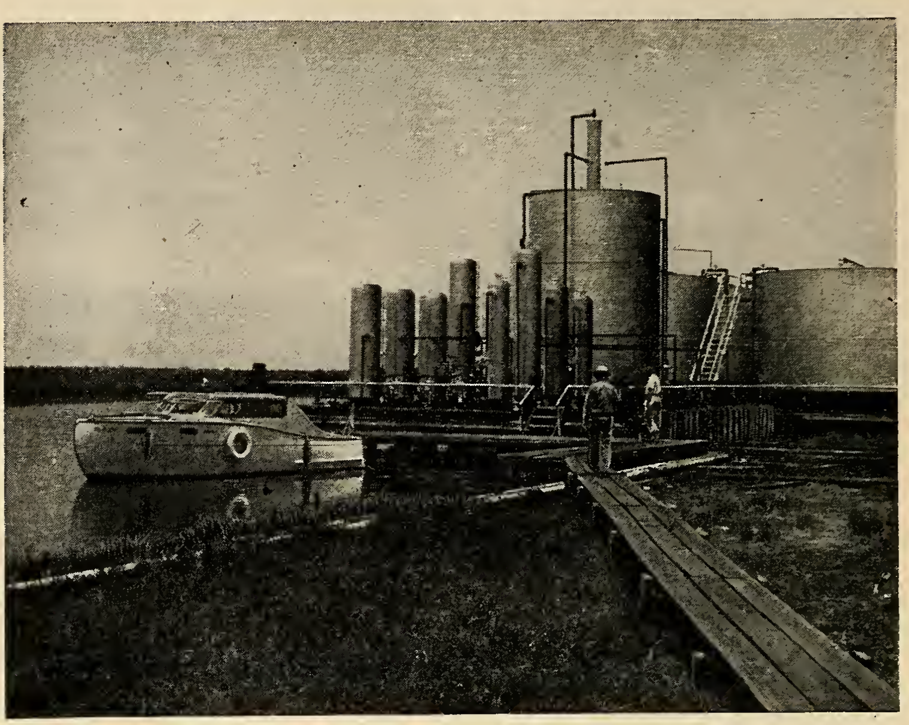
Act 367 of 1940 created the Stream Control Commission, Section 3 of which invested that Commission with authority to control waste disposal by either public agencies or private persons or concerns in any of the lakes, rivers and streams of the State, as well as in the coastal waters of the Gulf of Mexico within the territorial jurisdiction of the State "for the prevention of pollution tending to destroy fish life, etc."

Under date of September 9, 1946, the Attorney General's office advised the Commissioner of Wild Life and Fisheries, as follows: "The Commissioner of Conservation is no longer concerned with waste from oil wells in-so-far as that waste affects aquatic life. This is now the concern of the Stream Control Commission; and it is the concern of the Department of Wild Life and Fisheries only to the extent of enforcing the rules, regulations and orders of the Stream Control Commission."

Subsequent to, and as a result of this ruling by the Attorney General of the State of Louisiana concerning the responsibility for regular inspections of oil fields in the coastal areas of Louisiana and proper waste control disposal, the State Board of Liquidation was approached for a special appropriation to set up a Coastal Waste Control Section of the Division of Oysters and Water Bottoms and for the purchase of the necessary equipment. The original appropriation covered the period of January 1 through June 30, 1947, and was in the amount of $31,290.00.

This appropriation covered the initial purchase and outfitting of two small patrol boats and important laboratory equipment in the amount of $13,000. The remainder was for personnel and operating expense for this six-month period. The amount of the appropriation for the fiscal year ending June 30, 1948, is $57,630.00.

The first of the two boats was purchased and went into operation on March 10, 1947, the crew consisting

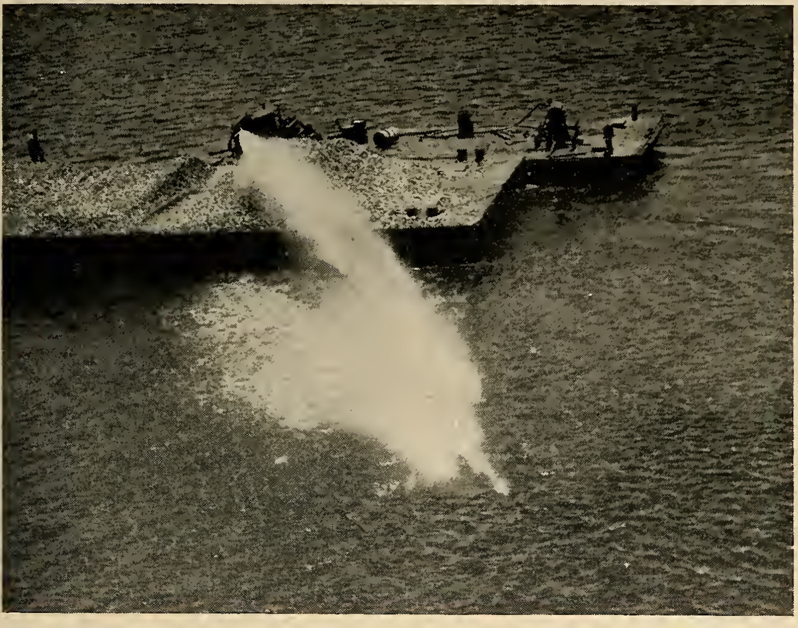


Coastal waste inspector noting violation of Stream Control Commission regulations regarding improper burning pit used for oil field waste disposal.

of boat captain and a waste disposal inspector. Pending delivery of the second boat, the waste disposal inspector for the second boat made initial inspection trips with the crew of the first boat during the early part of March. The second boat was put into operation on April 8, 1947.

These boats cover all oil fields in the coastal area from Delacroix Island in the eastern coastal area to Lake de Cade and Dog Lake on the western boundary, southwest of Houma, with the dividing line for the two inspection areas established at Bayou Lafourche. In addition, the boat working the eastern half also regularly checks waste disposal as practiced by the sulphur company at Lake Grand Escaille.

These boats are in constant operation, inspecting all fields in their respective areas. Each inspector turns in a written report upon completion of his inspection of any field visited. The original report becomes a permanent rec-



Hydraulic method used for bedding shells as oyster "cultch" on State Seed Oyster Reservation at Sister Lake.

ord of this Division, the second copy going to the Stream Control Commission, through Frank J. Coogan, and the third copy goes to the person in charge of the area visited.

Each inspector is equipped with a camera for the purpose of taking pictures of violations and polluted areas which may be encountered during an inspection. One print of such pictures is kept on file here in this office and a print is submitted to the Stream Control Commission. Thus all parties concerned receive first hand a list of violations as found by inspectors and are in a position to know what steps to take and what precautions are necessary in their future operations.

The two inspectors turn in their reports direct to their supervisor in the New Orleans office on Mondays of each week, at which time they receive any special instructions which may be forthcoming, regarding any special fields that require immediate inspection. In this connection, our plane pilots also make reports whenever they spot trouble from the air in any oil field in this coastal area.

Sister Lake camp and laboratory.

It is gratifying to realize that a definite change and improvement is noticeable since the inauguration of this Coastal Waste Control program. There have been a number of changes and improvements in procedures for disposal of oil field wastes. Our inspectors are constantly on guard to see that all installations are properly maintained to prevent spillage. Also it is their duty to see that all practical precautions are taken for the prevention of unnecessary pollution of State waters.

Both of our Coastal Waste Control boats took an active part in the dynamite experiments conducted by this Department in August, 1947, off Grand Isle. Our inspectors secured the specimens used and assisted the Chief Biologist of the Department in carrying on the experiments. One of these boats has also been used from time to time in connection with oyster field experiments, collecting samples, etc.

Special reports are prepared from time to time for the Stream Control Commission, pointing out violations that must be corrected and calling attention to consistent offenders, where special action may be called for.

OYSTER SEED GROUNDS REPORT

By Edgar F. Lindsey
Oyster Production Advisor

Proceeding under the authority of Act 227 of 1944 authorizing the acquisition for the State of Louisiana of existing oyster water bottom leases found within the limits of areas designated by the Department of Wild Life and Fisheries as Oyster Seed Ground Reservations, we purchased from Messrs. Oneil J. and Gillen J. Engeron Lease No. 8544 containing seven (7) acres in Sister Lake for $1,050.00, which gave the State the entire area of Sister Lake for the State Seed Oyster Reservation.

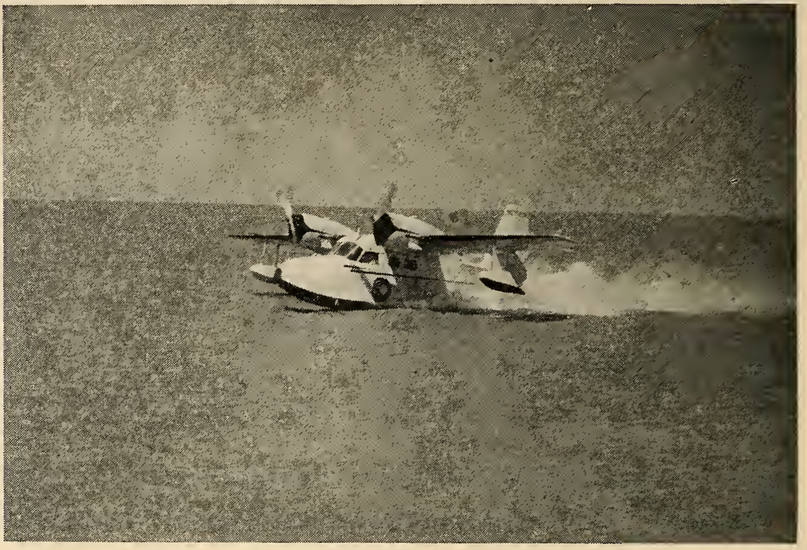
During the summer of 1946, 20,048 barrels of clam shells were planted in Bay du Chien, 29,478 barrels in Lake Felicity and 19,213 barrels in Sister Lake (State Seed Oyster Reservation), the contract price being thirty-five cents per barrel, making a total cost of $24,094.25.

In May, 1946, approximately 40,000 barrels of clam shells were planted in Bay Boudreaux, St. Bernard Parish, at a cost of $17,813.75.

In July, 1946, the watchman's camp at Sister Lake was totally destroyed by fire. Plans and specifications were drawn up for the construction of a larger camp with laboratory space. This camp and laboratory was completed in May, 1947, at a cost of $21,676.65.

Plans and specifications were drawn up in July, 1947, for the construction of a watchman's camp at Lake Felicity. This was necessary to protect the oysters planted on this State Seed Oyster Reservation. Due to the scarcity of labor and materials, this camp is still under construction but should be completed early in 1948.

Seed oysters removed from Sister Lake for the years 1946-1947 amounted to 217,100 barrels.



Off on a statewide patrol in largest type equipment used.

AIRPLANE ACTIVITY REPORT

By John H. Flynn
Chief Pilot

Since no report of aviation activities has been made in previous biennial reports the author will endeavor to bring up to date all flying activities of the Department.

In the Fall of 1940, the Department of Conservation under the direction of Major B. A. Hardey, decided to experiment with the use of aeroplanes, or to be more exact a seaplane, in enforcing the regulations of the Department, particularly the regulations of the Enforcement Division.

The services of a pilot, along with the use of the pilot's seaplane, was secured and put to work on December 1, 1940, on a trial basis with the understanding that the service would have to be proven to be of worth to the Department before it could become a permanent arrangement or service.

From that humble beginning the demand for increasing service has grown until today the Department operates three amphibious type planes, with the services of two pilots, for all divisions of the Department. However, since most

Small sized equipment used in checking pollution and other violations.

of the flying activities are at present being done for the Division of Oysters and Water Bottoms and the Enforcement Division the major part of this report will cover the work done for those two divisions with only a mention of other work done.

The Enforcement Division being the first to purchase a plane quite naturally has the largest number of flying hours to its credit, a total of 3383 hours since the inauguration of the service, with 942 hours of that time being flown since January 1, 1947, at which time the services of a second pilot was secured.

It might be pointed out at this time that until the Department owned more than one plane the pilot maintained and repaired the plane in addiion to his other duties, but with the acquisition of additional equipment the services of a mechanic was required, since the first pilot necessarily had to supervise all flying activities. The mechanic was employed in the late fall of 1946 after the purchase of the second plane.

In the beginning of the use of sea planes by the Department the work was purely that of observation, for the Enforcement Division. Flights were made over the different areas and if any violations were noted they were reported

Beautiful Bayou Liberty and first type of equipment used by Department.

to the Director who would send one of the Division's boats with agents aboard to make the investigations or arrests as need be.

As the reader has probably surmised this procedure did not work very long because the violators soon became aware of the fact that their activities in the area where the plane flew over them was being reported to the Director's office and they were apprehended shortly thereafter by the Department boats. They soon learned to move to some other area after the plane was out of sight.

It then became necessary for the pilot to work out some other method of solving the problem, so for several years boats of the Enforcement Division were sent to areas of known violations where the plane would meet them, direct their activities, and on occasion the enforcement agent accompanying the pilot would board such boats directly from the plane.

This method worked with varying success for several years, but became obsolete with the advent of larger boats in our fishing waters. The fishing boats were larger, more powerful and much faster than the equipment operated by the Department so it became a simple matter of hoisting gear and outrunning the Department's boats after the violator was spotted by the plane or vice versa.

Confronted with this problem the Department decided to make another change, this time to the use of a small, thoroughly seaworthy, extremely fast boat that would be able to operate from the larger Department boats as a base, and a move in that direction was made by building one boat at the Department wharf for this purpose. It worked with such success that another small boat was acquired soon for work on the opposite side of the river.

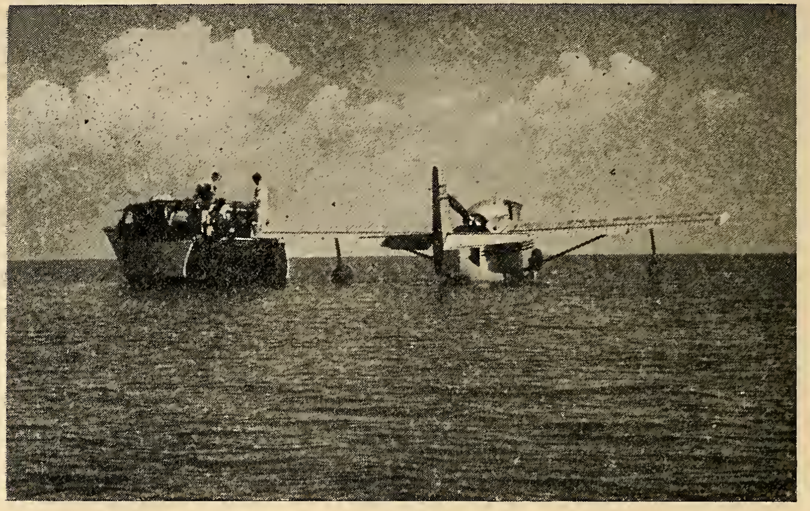
The use of the small fast boats working with the planes met with so much success during the closed shrimp season of that year, 1945, that violations were kept to the lowest levels in the history of the Department.

The year 1946 brought still another problem that had to be overcome. A great percentage of the fishing fleet began installing radio equipment, with which they could communicate with one another and which enabled easy warning from one boat to others. This was immediately combated by a change in flight procedures and mainly by the use of radio equipment borrowed by the Department.

At the beginning of the 1946 summer closed season on shrimp the Department of Wild Life and Fisheries borrowed four radio sets from the Department of Safety; two were installed in planes and two were installed in the small fast boats. With this arrangement working very successfully, violations were kept to still lower levels.

Other phases of Enforcement Division work capable of being done, and some of it being done, by plane consists of checking all types of licenses issued to boats by the Department; checking of trappers' licenses in accessible areas; illegal hunting, particularly wild fowl, in the water areas; illegal trapping, during closed season in the marsh areas, and various other violations that arise from time to time, some mention of which is made later.

No claim is made whatsoever as to the value of the planes in the enforcement work over the land areas of the State, except in a psychological way, although there have been many instances of a very tangible nature where planes have been used even in the northern parishes to apprehend violators, particularly along the rivers and lakes of that part of the State.



Checking hunting party for over limits and licenses.

The need of planes in the Division of Oysters and Water Bottoms was recognized by James N. McConnell, Director, immediately following the beginning of the service in 1940. They became a necessity of the first magnitude when the Stream Control Commission placed upon the Oyster Division the work of patrolling and enforcing its regulations in the coastal areas of the State, particularly those areas in which oil is produced or in which chemical plants are located in proximity to oyster beds of the State.

While much work had been done for the Oyster Division by the Enforcement Division's plane and pilot prior to the time the Oyster Division purchased a plane, it was never very satisfactory since the greater part of the time both divisions needed the plane at the same time as shell bedding operations were under way usually at the same time the shrimp season was closed, then the natural oyster reefs would be closed at the same time the seining areas were closed.

In 1946 after the Stream Control Commission placed upon the Division of Oysters and Water Bottoms the work of looking after the coastal areas, the Director saw the necessity of the Oyster Division having its own plane. Faster and considerably more accurate work can be done by plane since a pilot can see polluted areas from above and deter-

Checking seine boat for illegal equipment.

mine their extent as to surface area whereas a boat on the surface in a large number of times would pass through the same area without noticing any pollution unless it was in heavy concentrations. In order to determine the size of the area of pollution a boat must take samples over all of area, which would be impractical to say nothing of time consumed.

The hurricane of September, 1947, destroyed the building at Grand Pass housing the oyster laboratory and all work being done on the oyster mortality project, which is considerable, has been transferred to the laboratory of the U. S. Fish and Wildlife Service at Pensacola, Florida, and to a new laboratory at Sister Lake in lower Terrebonne Parish. The operation of these laboratories make necessary considerably more flying than was anticipated since fresh samples from the various oyster beds must be taken and delivered to the laboratories in a minimum of time and this can be done more efficiently by plane.

There is also the work of patrolling the restricted seed ground areas and that of transporting the division biologists to and from the beds in order that their work may be accomplished in an efficient manner. The planes have been of inestimable value in protecting the natural reefs during the closed season and enforcing other regulations of the Oyster Division.

Rescue work after hurricane of September 1947.

In the Fur and Refuge Division, as in the Fish and Game Division, some use has been made of the planes, particularly in checking the marsh areas to determine the condition of the muskrat lands, etc. However, much more use in these Divisions for the planes could probably be found if the planes were available to them more of the time.

No mention has been made until now of the actual use by the public of the planes, although approximately ten (10%) percent of the total hours flown by the planes are done directly for the public, in performing various services. Typical examples are the rescue work immediately following the September 1947 hurricane, work done during the 1945 floods, numerous searches for lost and drowned persons, searches for boats on which there are persons who have had deaths in their family at home, searches for lost boats or boats overdue in their home port, assistance given various federal agencies and also work done for other state agencies.

DIVISION OF RESEARCH & STATISTICS

FRANK COOGAN, *Director*

The Division of Research & Statistics operated on a greatly increased budget in the years 1946-1947 and 1947-1948. This allowed the Division to obtain some much needed new equipment and to replace equipment that had deteriorated through age and use. The budget allowed salary increases for employees of the Division to partly compensate for the increased cost of living. The budget however was not large enough to allow the hiring of a Biologist to replace the Biologist who resigned to accept other employment at an increase in salary. That the Division needs a good Biologist goes without saying because work must be done to determine the multiple effects of industrial wastes on the waters of this State, not only kinds of waste that will kill fish but also the effects of these wastes on the food cycle and the fish cycle itself and so it is hoped that in the coming year there will be made available to the Division the services of a Biologist who will be capable of conducting the necessary research.

The weather for the past two years has been very spotty varying in condition from one extreme to another. During the middle months of 1946 the State received a great amount of rain. This rainy weather kept up all through the summer but ceased during the late winter months and did not recur again until the spring of 1947. During the first part of 1947 a great deal of rain fell and cleared the streams of the State and then the State went into a period of drought such as has not been seen since the early twenties. This meant that during the summer of 1947 that all through the State water levels fell to record lows and there were a great many cases of fish mortality due to natural conditions and beyond the control of this Department. Vegetation died due to the lack of water and added the oxygen demand to that of the already overburdened low waters and resulted in the killing of fish in borrow pits, small lakes and other water bodies. There were places where fish died through lack of oxygen where there was no known means of contamination by industrial or municipal wastes. Fish died in the lower areas of Cameron Parish and in Lafourche Parish strictly from natural causes.

At the start of the sugar grinding season the streams of the State were extremely low and fish mortality occurred within a week after the start of the grinding season. However about a week and a half after grinding started there was a series of very heavy rains which flushed out the streams and kept them flushed out until some time in December. In the middle of December as the stream flow dropped down due to lack of rainfall fish mortality again became evident but disappeared quickly as a result of heavy rainfall in the latter part of the month of December and the conditions cleared up and stayed clear the balance of the grinding season. The little amount of rainfall also affected the discharge of the paper mills which will be gone into later. Otherwise the weather conditions were average as far as the years were concerned but very spotty as to the time of rain. There were periods of very heavy rain and periods of drought, which brought the worst conditions that could result in the State at any one time as far as pollution was concerned.

The Division has been given an increased work load in the chemical laboratory with the establishment of the oyster research program under Dr. Owen and Mr. Ingle of the Division of Oysters and Waterbottoms. The Division is doing all the chemical analysis found necessary in this work which includes the analysis of oils for sulphur and selenium, the analysis of sea water for sulphur, selenium and heavy metals, the analysis of bleed water for oil content, sulphur, selenium and the heavy metals and the analysis of oysters for heavy metals.

The co-operative work that the Division is greatly interested in has made much progress. The Louisiana Petroleum Refiners Waste Control Council who is sponsoring research into the effects of refinery wastes on fish life has evidenced increased interest in this work and it is believed that the work will continue on for several years. The work financed by this Council includes the investigation into the effects of refinery wastes on fish, how it kills these fish and what effects chemicals and chemicals in combination have on various species of fish. This work is new; there is not very much in the scientific literature on this subject and it is planned that the information obtained will be published for the information of all concerned.

The National Council for Stream Improvement of the Pulp, Paper, and Paperboard Industries, Inc., has established at L.S.U. a project for the investigation into the correction of wastes from sulphate pulp mills of which there are seven in this State. This work is going ahead very rapidly under the direction of Mr. William Maggio, Research Associate of the Engineering Experiment Station and it is believed that this work will result in materially reducing the pollution problem that these mills have here in the State of Louisiana.

Specifically the study includes the use of bacteria to lower the biochemical oxygen demand of the wastes from the washers. This waste comprises about 12% of the waste of the mill and carries over 50% of the oxygen demand of the total wastes from the mill. This means that any correction made in the lowering of the B.O.D. of this waste will materially lower the B.O.D. of the total mill waste. Co-operating with this project is the Department of Bacteriology of the Louisiana State University. This work is a bright spot because sooner or later it will result in solving the problems of the paper mills of this State.

It is planned in the near future to hire for the Division two additional Waste Disposal Inspectors I. These Waste Disposal Inspectors will be stationed at Houma and Shreveport, respectively. This will allow coverage of the sugar mill area by the Waste Disposal Inspector stationed in Houma. He will cover the Bayou Teche and Bayou Lafourche Areas and the lower portion of the Mississippi River District during the sugar grinding season and will also keep a close check on the oil operations in Terrebonne, St. Martin, Lafourche and St. Mary Parishes. The Waste Disposal Inspector stationed in Shreveport will be primarily concerned with the oil fields in the northwest part of the State. This area has up to now been covered by the Waste

Disposal Inspector in Alexandria who has been responsible for the whole north end of the State of Louisiana. This is too much of an area for one man to cover and spend the amount of time on research that will be necessary in this area in the near future. So it is planned that the Shreveport Inspector will be responsible for the oil and gas areas of the northwest part of the State and also of the paper mills and the Shreveport industrial area. The inspector in Alexandria will then be able to cover the area around Monroe, the oil fields in LaSalle Parish, and the paper mills in the northeast part of the State.

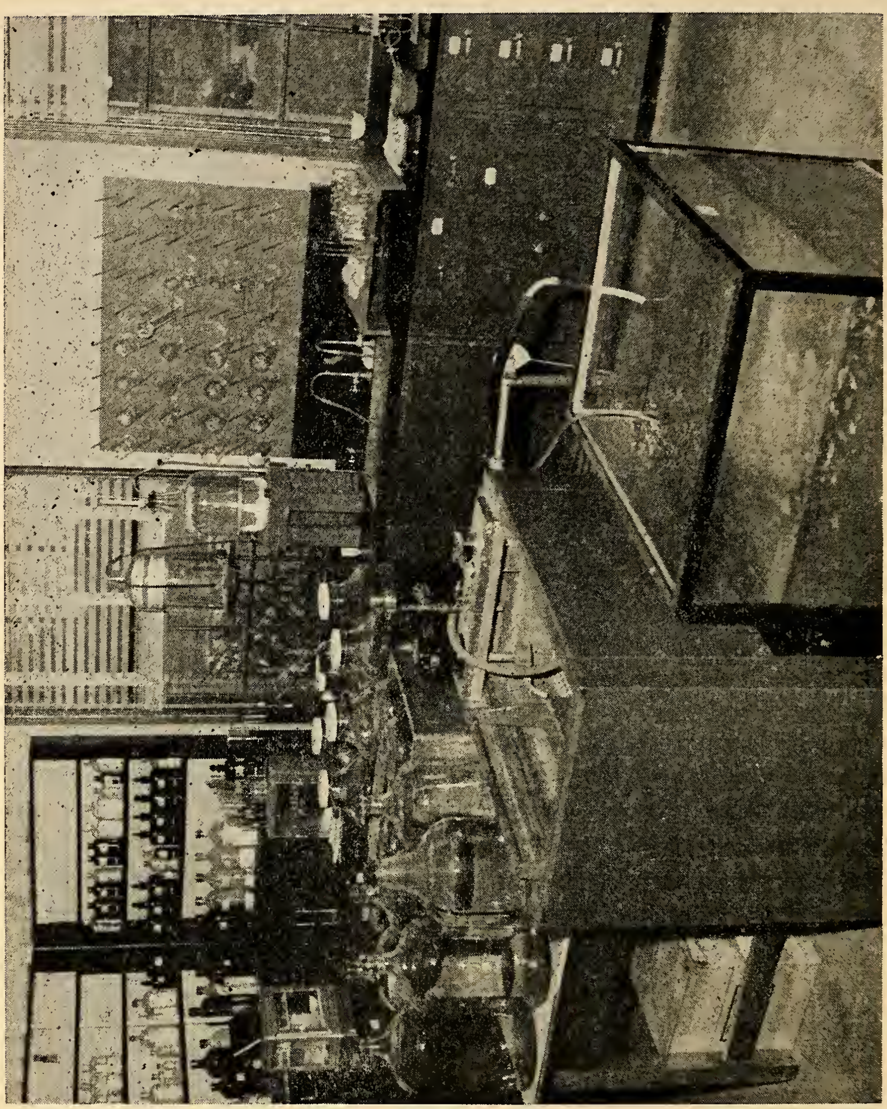
It is believed that with an inspector stationed in Shreveport, Alexandria, Lake Charles, and Houma that proper supervision of the State will be possible. The Biologist mentioned in the preceding paragraph will be stationed at Baton Rouge and will more or less cover the whole part of the State as far as biological research is concerned, and will be available to help the Waste Disposal Inspectors in their problems. It is also believed by the Director that some work should be done on the ecology of the lakes of the State to determine the variations in the lakes and why it is that some water bodies seem to be able to handle waste much easier than others. It will also allow the Division to keep a closer check on the industries already located in the State and will allow a very close investigation of the waste disposal plans of industries interested in coming into the State.

One of the activities of the Division that has increased in the past few years is the aid that it has been able to give the executives of industries interested in locating in the State of Louisiana. As industry is becoming more and more conscious of the problems of industrial waste disposal, more interest is shown in the proper location of a plant with respect to the disposal of industrial waste. The Division has been able to supply several companies with locations suitable for the type of waste to be disposed of and it is hoped that the Division will be able to help promote the industrial development of the State and at the same time preserve the fish and wild life as much as possible.

II. POLLUTION ABATEMENT

Pollution from Pulp and Paper Mills
Northwestern Louisiana

The largest paper mill in the State is located in the northwest corner of the State, in Bossier Parish about fifteen miles below the Arkansas line. This paper mill is one of the largest kraft paper mills in the United States, porducing 1000 tons of kraft a day. The waste water resulting from the production of this tonnage of paper reaches enormous proportions, averaging 25 million gallons per day, all of which is, at the present time, impounded in waste reservoirs. Once a year these reservoirs must be emptied to take care of the waste from the coming year. Normally it is possible for the mill to wait for a good flow of water down the stream before begininng discharge, and the rate of discharge could be held down until the stream was cleared of any fish before increasing the rate of flow from the reservoirs. In 1946-1947 this was possible as there was a great deal of rain. Discharge commenced on November 11 of 1946 and the gates were closed on December 15, 1946, after having discharged approximately 1,180,000,000 cubic feet of waste. There was very little evidence of fish mortality, all fish having been cleared out of the stream before discharge started. This waste enters Bodcau Bayou about ten miles from the Arkansas line continuing down into Red Chute and Loggy Bayou, hence into Red River about fifty miles below Shreveport. The effects of this waste are easily discernible in the Red River at low stages. In 1947-1948 the stream flow never did increase to the point where it was considered safe to begin discharge. As time passed the amount of waste in the basins increased until little storage space was left, so it was decided that, regardless of stream conditions, that discharge would have to start. The gates were opened November 22, 1947, and closed January 5, 1948, with the discharge of 1,200,000,000 cubic feet of waste. There were several instances of fish mortality due mainly to the fact that stream flow was not enough to allow the clearing of the stream before discharging large amounts in high waste to water ratios.



One of the Departmental laboratories now used for paper mill waste research.

There has been installed in this mill over a million dollars worth of new equipment in the past eighteen months. This installation of new equipment has resulted in materially lowering the oxygen demand of the waste, but it is very questionable whether any work inside the mill will result in a waste which can be discharged into such a stream as Bodcau Bayou without causing fish mortality or resulting in lessening the Bayou's use for other purposes. When dealing with a volume of water such as was mentioned above it should be realized that the waste water doesn't have to have much of an oxygen demand to completely wipe out the oxygen in a stream the size of Bodcau Bayou and Loggy Bayou. The waste is not stabilized by the time it reaches the red River but the dilution ratio obtained in Red River is so great that it does not kill any fish in Red River.

It is believed that using the knowledge gained in the research program sponsored by the National Council for Stream Improvement, that it will be possible to segregate the wastes discharged from this mill and to lower materially the oxygen demand of the worst waste so that the composite waste can be discharged into the stream without causing the difficulties which now arise each year following discharge. Investigations within the mill are going on now and it is hoped that within several years this condition will be improved.

III. NORTHEAST LOUISIANA

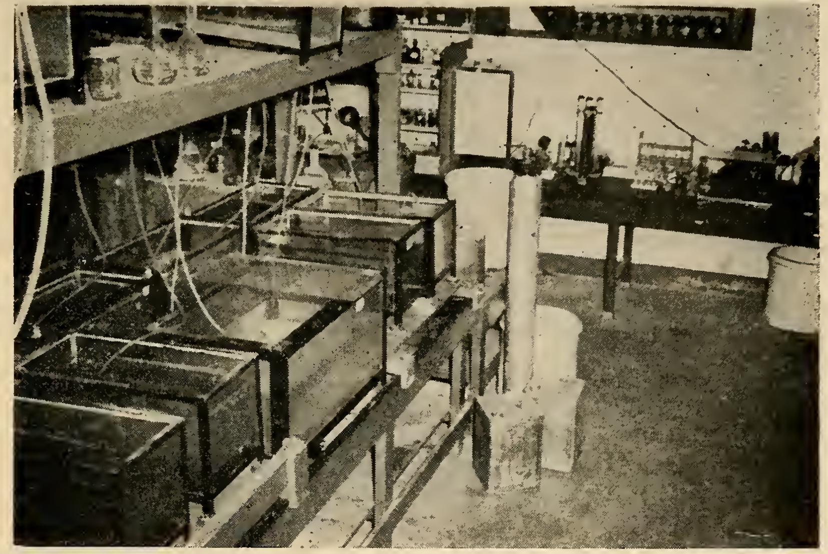
Two mills are located in Bastrop, Louisiana, in Morehouse Parish. They are different from the mill in western Louisiana, in that the product is the same but the process is different. The waste from one of the mills is piped to the other mill for recovery and the combined effluent from two mills is discharged. The mill discharge goes into Bayou Lafourche, which is a stream of very slow movement and very low flow most of the year. For a period of 100 miles down below these mills the water is very dark and the stream conditions are not at all suitable for fish life. The main objection to the discharge from these mills is that cattle do not choose to drink this water and it makes an area of Caldwell Parish unfit for pasturing cattle because of lack of suitable water. It is probable that the answer to this situation will be the impounding of a certain part of the mill waste, and holding it for discharge in periods of high flow. The other portions of the waste can be discharged all through the year and will not be obnoxious to cattle. This is being worked on by officials of the mill in co-operation with this Division and it is hoped that within a period of several years this problem will be solved.

IV. WEST CENTRAL LOUISIANA

Normally there is no difficulty involved in the discharge of waste from the mill located in this area of the State. However, in the fall of last year, through negligence, there was allowed to remain open a valve leading from one of the retention basins and waste of great strength was allowed to flow down through Mill Creek down into the upper Calcasieu, and fish were killed twenty-five miles down stream from the mill. This was a result of carelessness and charges were filed against this company with the District Attorney of Calcasieu Parish.

V. CENTRAL LOUISIANA

The company in this area has installed a series of retention basins and has been exceedingly fortunate in having no trouble with waste discharge in the past few years. There is a great deal of flow in Little River, averaging 300 to 400 cubic feet per second. With good judgment this mill has been able to discharge several months each year without killing any fish or hurting the aquatic life of Little River in any way. However, in the summer of 1947 someone with the intention of harassing this mill, opened the discharge gates and allowed an unknown amount of black liquor to flow down Dugdemona Bayou. There was not enough water in Dugdemona Bayou or Little River to care for this waste at the time at which it was released from the retention basin. To take care of this situation the Department in co-operation with the Mill constructed a series of earth dams across Dugdemona Bayou, holding the black liquor back in the Bayou and allowing natural corrective conditions to lower the biochemical oxygen demand of this waste to the point that when the rains finally came in the fall and the earth dams washed out, the black liquor ran down through Little River and into the Catahoula Lake without killing any fish in Little River. In order to make sure that the situation would not happen again certain changes were made in the discharge gates so that it would not be possible for anyone to again discharge waste without the full knowledge of the Southern Advance Bag & Paper Company.



View of biological laboratory.

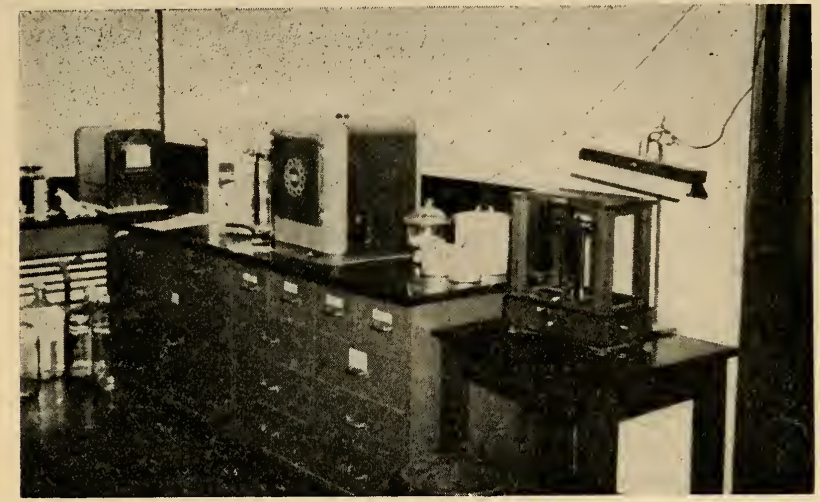
There was another instance of fish mortality in Homer Lake during the discharge of 1947-1948 due to the water backing up from Dugdemona Bayou and getting into the Lake. Bulldozers will be used to correct this situation and keep the waters of Dugdemona Bayou out of the Lake during discharge period.

SUGAR MILL POLLUTION

The sugar mill grinding season of 1946-1947 resulted in fish mortality in a number of streams in the sugar growing areas of the State. After the season there were two meetings called by representatives of the Department of Wild Life & Fisheries and attended by the members of the pollution committee of the American Sugar Cane League. These meetings were held in the early part of January, 1947, and at the first meeting there was proposed a set of rules and regulations governing the discharge of sugar mill waste. After the proposed rules and regulations were given to the Committee, the meeting was adjourned and copies of the rules and regulations was sent to the sugar factory operators in the State. A second meeting was called in Thibodaux and there were various objections raised to the adoption of these rules and regulations. It was decided that the rules would be held in forbearance for the next grinding season and every effort would be made by the mills of the State to stop the pollution of the various streams. There are a number of hot spots in the State as far as sugar mill pollution is concerned and particular attention was paid to correction of pollution by mills in these areas.

VI. BAYOU TECHE AREA

A great number of fish died in Bayou Teche during the 1946-1947 sugar grinding season as a result of contamination of Bayou Teche by wastes from the various mills scattered up and down the Bayou. It should be realized that Bayou Teche as it stood at that time was not capable of stabilizing the quantity of waste that was discharged into it. The discussion in January, 1947, as far as the Teche was concerned, centered upon the desire on the part of the Department of Wild Life and Fisheries for the mills along the Teche to lower the load put into the stream by lowering the B. O. D. requirements of the waste. This could be done by discharging into the stream only one waste, condenser water. All other wastes would be impounded or otherwise disposed of. Much work was done by the mills along the Teche in preparation for the 1947-1948 grinding season. In addition to corrections being made in the mills the conditions that could be looked for in Bayou Teche during the 1947-1948 grinding season was greatly improved by the announcement by the Corps of Engineers, U. S. Army, that the upper Teche was going to be opened up with the possibility of increasing the stream flow as much as 400 second feet. This was done by clearing the channel and de-snagging upper Bayou Teche which allowed more water to flow into it from Bayou Courtableau. Bayou Courtableau has a stationary control gate which dumps all water above an eighteen-foot elevation into a borrow pit running down the Atchafalaya River protection levee so that it was not possible to say that there was more water to be diverted from Bayou Courtableau. Such is not the case, but more water would flow from Bayou Courtableau down the Teche rather than over the stationary gate and into the protection levee. The effects of this work showed in the 1947-1948 grinding



Section of Chemical Laboratory showing analytical balance and drying ovens.

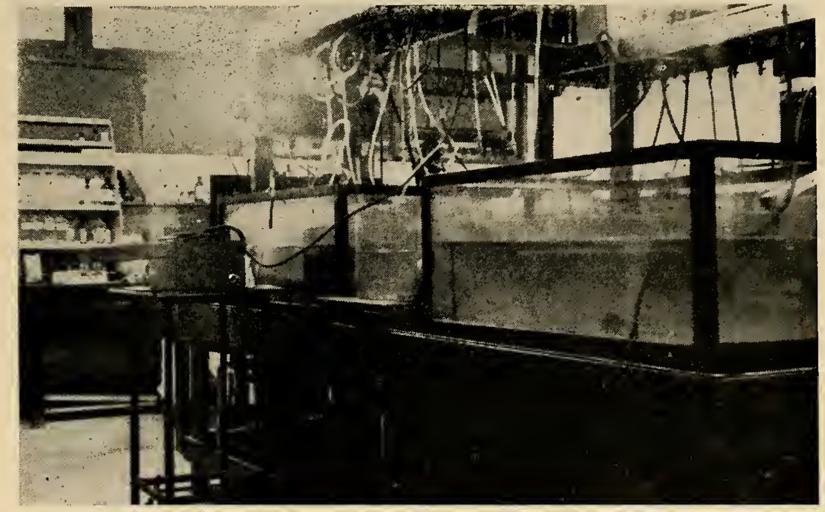
season because it was without doubt the best season as far as the Teche was concerned that has been had since the modern grinding period. Shortly after the grinding season started fish mortality was reported in the lower Teche which was natural because the waters far down the stream would have accumulated waste from all the mills above it. The rains mentioned in the introduction of this report came about a week after the grinding season started and cleared the Teche completely and increased the flow to the point where the dilution ratios were such as to comfortably handle the discharges from the mills. In December the waters began to again show the effects of the discharge but rains came and cleared Bayou Teche. All in all it was a very good season as far as fish mortality on Bayou Teche was concerned.

The Department has prevailed upon the Army Engineers to cut down to an absolute minimum any diversion of Bayou Teche water through the Ruth Canal into the Vermilion River. The Department has no objection to the diversion of this water during the rice growing season but holds that during the sugar grinding season every drop of water in the Teche is needed in the Teche and should not be diverted into the Vermilion River. The Army Engineers have offered no objections to this viewpoint and will continue to operate the Ruth Canal locks in the same manner that it was operated during the 1947-1948 grinding season.

VII. BAYOU LAFOURCHE

In the 1946-1947 grinding season there was one bad spot in the Bayou Lafourche Drainage Area, the Grand Bayou, Bayou L'Onion System which empties into Lake Des Allemands. There are two mills located in this drainage area and these mills obtain their cooling water from Bayou Lafourche. The water flows through the plants and out through the back and into Bayou L'Onion and down into Lake Des Allemands. There is no possibility of disposing of the water back into Bayou Lafourche because the drainage in this area is directly away from the Bayou, rather than towards the Bayou as is the case in the Bayou Teche Area. Many corrections were planned by the operators of the two mills to lower the Biochemical Oxygen Demand of the wastes and assurances were given that only condenser water would be discharged into the streams to the rear of the mills. Unfortunately, about three weeks before grinding season started, the Corps of Engineers put a water hyacinth control boat into Bayou Lafourche and using the saw method destroyed the water hyacinths by cutting them to bits. These water hyacinths rotted and put a very heavy oxygen demand on Bayou Lafourche to such an extent that Bayou Lafourche was not capable of supporting fish life of any kind.

The writer made an inspection of the Lafourche Area shortly after the grinding season started and found dead fish and dead crabs floating in the Bayou water. This meant that even before the bayou water was pumped into the mills it had an oxygen demand sufficient to cause a depletion of oxygen in any water body receiving it. Naturally enough, this water had the additional oxygen demand load added to it by the mills, and when this water was pumped into Bayou L'Onion, it resulted in fish mortality in that Bayou and in Grand Bayou. The water stabilized before it reached Lake Des Allemands and no fish mortality was noted at that point. What is to be done about this situation is not known at the present time. The operators of these



Tanks and equipment used for experiments to determine the effects of industrial waste on fish and other aquatic life.

two mills mentioned above have evidenced every desire to cooperate with the Department in the clearing up of these conditions but have pointed out that since the water used has a very heavy load to start out with, even if there is added a very slight load to this that it would pollute Bayou L'Onion in the back. Studies are being made of this problem and it is hoped that in the future some means will be devised to take care of the situation.

VIII. Mississippi River, Bayou Choctaw Area, Iberville Parish

In times gone by there have been a series of fish killings in the Mississippi River, Bayou Choctaw Area, mainly in the area drained by Bayou Tigre and Bayou Daniel which flow into the lower Choctaw. There are a few mills located in the front of these two Bayous and drainage ditches through the fields carry the waste from these mills into these Bayous and hence into lower Choctaw. Bayou Tigre and Bayou Daniel are not large enough to carry this load and the flow in lower Bayou Choctaw is not sufficient to offer enough oxygen to effect the natural correction of these wastes and heavy fish mortality results. The only answer that is seen to this problem is to have the mills put in pipe lines and pump the wastes from the mills over the protection levee into the Mississippi River. This will entail some expense, of course, but it is the only solution that is in view so far, other than the construction of cooling ponds. The use of cooling ponds means that the water will be used in the mill, pumped out to a cooling pond through cooling sprays and hence back into the mill for reuse. This is a very expensive proposition running in the neighborhood of $35,000 to $40,000 per installation for mills of this size.

There is one mill discharging waste into Grand Bayou in Iberville Parish. Grand Bayou is another bayou about the size of lower Choctaw and the strength of the waste going into Grand Bayou is such as to result in fish mortality during the grinding season. Grand Bayou and the water system into which it flows is one of the best fishing spots in this part of Louisiana. Naturally, periodic killing of fish in this Bayou, has caused a great number of complaints from residents of Iberville Parish, which are strictly justifiable, and this waste too, must be pumped into the Mississippi River. Again expense will be substantial but under the laws of the State of Louisiana and the necessity for correcting this condition, it is the only solution that is in view at this time other than the use of cooling ponds. Grand Bayou, by the way, flows into Lake Verret and there have been instances where fish died all the way from the junction of the ditch carrying the waste into Grand Bayou, all the way down into Lake Verret.

Another condition very similar to the one mentioned above is the fish mortality caused by mill discharge into a canal which goes into Lake Natchez, Iberville Parish, and so down to Grand River. This is one of the strongest wastes that has ever been found coming from a sugar mill, running in the neighborhood of 450 p. p. m. B. O. D. This would mean that waste of this strength, with a volume discharge of around 66,000 gallons per hour, would have to have a small sized river with a good flow in it to assimilate and correct it. And this is not the case. This mill too, can use the Mississippi River for disposal of its waste which would require the laying of a pipe line and the pumping of the waste over the levee into the Mississippi River. In all cases where such pipe lines have to be laid over the levee, the permission of the War Department must be had, but this Department has found that the War Department is anxious to cooperate in cases of this kind and offers its permission readily if the proper conditions of construction are followed.

In review it might be said that the grinding season for last year in all respects was much better than the 1946-1947. season. Some of this is due to the very very favorable rainfall distribution during the grinding season but a considerable part of the improvement is due to the efforts of the sugar industry to improve the character of wastes and to impound or otherwise dispose of wastes wherever possible.

Oil Field Wastes

The Division is concerned with the disposal of wastes from oil fields located in all parts of the State of Louisiana except what is known as the coastal areas which will include the fields to be found in the swamp areas of the lower parishes such as Terrebonne, Lafourche, Plaquemines, St. Mary, etc. The discussion of the disposal of these wastes will be broken down into three parts; North Louisiana, Central Louisiana, and South Louisiana and different areas in each of these three parts of the State will be discussed.

In the Northern Area the largest source of pollution is the Caddo Lake Field, Caddo Parish. This field is old and the production in this field is stripper production. It is almost altogether pumping and the oil produced per barrel of salt water is very small, three barrels of oil to 97 barrels of salt water is a good coverage. It follows that there is a great deal of salt water to be disposed of from this field and it also means that open pit separation of oil and salt water is used, and that the separation is not effected in gun-barrels or in tanks or anything else but in open pits formed by levees. This method results in spillage of oil. The spillage of oil comes from the efforts of the operators to drain the salt water off of the pits and to drain the oil off into storage tanks. Pollution of this type has been going on in this field for many years and has resulted in the killing of timber, grass, and vegetation. It has been the aim of this Division to hold down as much as is humanly possible the

Waste Disposal Inspector determining the amount of oxygen in one of the streams of the state.

spillage of oil from fields of this type by constantly calling to the attention of the operators requirements set up by the Stream Control Commission for the disposal of wastes from oil and gas fields.

One of the other main sources of trouble in this field is that oil has been produced from wells drilled in Caddo Lake. Flow lines run from these wells into the separators on shore or suspended over the lake. These flow lines are old and break quite frequently. Every time one of these flow lines breaks, a barrel or two of oil escapes before the break is noticed and the flow line cut off and mended. The only solution to a problem of this sort is to replace the flow lines. The companies involved in this operation have been very cooperative in this matter and have replaced a great number of flow lines in Caddo Lake. Caddo Lake is one of the main fishing areas of northwest Louisiana and it is the intention of this Division to keep it free from oil and keep the salt water content of the lake down to a point where it will not affect the aquatic life of the lake.

Other fields in the Shreveport Area such as Belleview and other stripper fields offer the same difficulty as have been mentioned above and the same efforts are being made to hold the loss of oil to an absolute minimum. To force operators in a field of this type to drill disposal wells would mean that the money required would be much more than could be gained from the wells and would result in shutting down of fields of this type.

In the Monroe Area there is a new field called the "Ora Field" that has come into production in the last year or so. This field came in making a great deal of salt water and it was thought that trouble would be had at this point. However the operators in this field have gone ahead with the drilling of disposal wells and have put three such wells into operation and no salt water is being disposed of other than down into the strata from which it came. This is very satisfactory and it is hoped that as new fields come in in the State that this procedure will be followed by the operators discovering such fields. Lake St. John Field located on Lake St. John had production of salt water and for a time disposed of the water into Lake St. John but now disposal wells have been completed and all salt water is put underground.

In Central Louisiana the main oil production is concentrated in LaSalle Parish where there are five fields of great magnitude. All these fields drain into Catahoula Lake and it has been the aim of this Division to clear up the discharge of brine into Catahoula Lake, such brine being the major cause for the disappearance of duck food and other vegetation from the Lake. The operators of the Olla Field and the Nebo Field have agreed to install the necessary gathering lines and pumps and to condition such wells as will be necessary to effect sub-surface disposal of all brine produced in these fields. Ultimately this will involve a total of 30,000 barrels a day. Last summer the Little Creek Area was subjected to a plague of salt water mosquitoes. The Louisiana Department of Health reported this prevalence of salt water mosquitoes and gave the opinion that such mosquitoes were breeding in water which has been made briny by discharge from oil fields. It seems hard to believe that mosquitoes could breed in water made salty from oil field brine because of the oils that are dissolved in this brine, but such is said to be the case and an investigation is now going on to discover whether the mosquitoes are breeding in brine areas or whether the mosquitoes were

Waste Disposal Inspector with equipment used for obtaining water samples.

blown in shore from the Gulf by the hurricane of last September. The last opinion has been offered by representatives of the oil companies. Studies next summer will undoubtedly prove one theory or the other true and if necessary corrective measures will be taken.

In south Louisiana in Calcasieu, Cameron, Vermilion, and Acadia Parishes the main objection arising from the discharge of oil field brine is the possible plant mortality caused in the growing rice fields. This possibility has resulted in issuance of an order by the Stream Control Commission that no brine will be discharged into any streams used for rice irrigation purposes after the 15th of January of each year. Such orders have been issued in previous years and the vast majority of the fields producing salt water in these Parishes have brine gathering systems and sub-surface disposal. When this order was first issued most of the fields in the rice area had retention basins but such basins are always troublesome in that levees may break, flooding may result from heavy rains and allow no capacity for brine storage and so on to the point that most oil operators have found that sub-surface disposal is the easiest and the cheapest means of disposing of brine during the period in which its discharge into the streams of the State is forbidden.

In the area around Baton Rouge and in Iberville Parish the only trouble arising from the operations of the oil fields is that in periods of low rainfall and low stream flow, the concentrations of chlorides in the streams will get to the point that it will cause mortality of fish. This happened once in Iberville Parish and a telephone call from this Division to the operators of this field resulted in the closing in of nine producing wells until such time as stream flow would allow these wells to be produced again. The cooperation of the oil companies of the State in this matter is greatly appreciated. One of the points that will be cleared up in the next summer or so is the matter of the use of water for irrigation crops other than rice. One stream carrying water from the University Oil Field is now to be used for irrigation of strawberries and it looks as if the field will have to find other means of disposal of its salt water. The writer has found that such situations can be cleared up with the contacting of the proper people in the oil company involved.

Food Processing Plants

During the 1946 packing season there was a lot of difficulty arising from the operations of food processing plants, in particular sweet potato packing and dehydrating plants. However the matter was gone over thoroughly with the operators of these plants and it was suggested that screens and other devices be used to remove the suspended particles from the waste before such waste was allowed to reach the streams of the State. It is a pleasure to report that no difficulties were had during the past packing season. These plants are concentrated in the Opelousas, Church Point, Lafayette Area in the sweet potato growing parishes and in Washington Parish. It is hoped that in the coming years that the conditions that existed in the past year will continue to exist and that no fish mortality from discharge of this type will occur. If it does occur it is possible or probable that some other method of treating this waste will have to be developed. In the sugar beet areas of the central states and in Michigan there has been a great deal of work

Inspector testing water from Bayou D'Inde, a tributary of the Calcasieu River.

done in the handling of this type of waste and certain types of filters and sand basins have been developed. If it proves necessary the design of these treating systems can be had and the plants involved will, without doubt, see the necessity for installing such equipment and making such installations.

The waste from these plants, without treatment, is very potent. It contains a large amount of sugar and caustic and is hot and completely devoid of oxygen when it enters the stream and it is not difficult to see the trouble that would come from discharge into the slow moving bayous of the potato growing country.

Petroleum Refineries

After the formation of the Louisiana Refinery Group the problems relating to pollution by the petroleum refineries of this State were handled by that group and by this Division. This allowed a pooling of information as to ways and means of handling waste and has resulted in materially lessening the pollutional load on waters of the State from this type of industry. There has been a great deal of improvement within the State in the past few years to the point that the only difficulty that has lately arisen is that which happens during periods of extremely low flow of some of the water bodies into which such waste was discharged. Specifically, the Calcasieu River Area suffered greatly from fish mortality in Moss Lake during the late summer months of 1947. This was not due to the chemical content of waste being discharged so much as it was due to the extreme low water during the period and to the almost total lack of downstream flow of the Calcasieu River. It is a fact that several times in late 1947 the east fork of the Calcasieu River in the vicinity of Kinder was pumped absolutely dry by irrigation pumps, such water being used for rice. This meant that during the drought period that the flow of Calcasieu River was cut down to a low point. The refinery used water from the Calcasieu, put it through the refinery and discharged it in very good condition in so far as toxicity, chemical and oil content was concerned. The main difficulty arose from the fact that this water, approximately 200,000 gallons per minute, was discharged at a temperature of 100 to 110° and was totally devoid of oxygen. As it had not been foreseen that such low stream flows would be had in this area there was no provision made for cooling the water and reusing it, consequently this water was discharged into the river and water was drawn from the river to continue the cooling of the refinery equipment. As the river flow became tidal this meant that the same water which had been used previously was again drawn into the plant and discharged below. As the tidal effect became the only moving effect on the River this meant that the same water was being used over and over again to the point where a long stretch of the River was rendered completely devoid of oxygen. As this body of water moved down the River it entered the upper end of Moss Lake, moved across Moss Lake and formed a barrier to a pocket of fresh water on the west side of Moss Lake. As the oxygen depleted water moved into this pocket it killed all fish trapped in this pocket by putting them into water deficient of oxygen to the point that the fish could no longer live. This problem was not anticipated by the Refinery nor was it foreseen by this Division, as the Calcasieu River normally has a suffi-

"Catching" a sample from Bayou D'Inde.

cient stream flow to take care of this type of waste, that is the use of water and return of water without oxygen, but having no other characteristics detrimental to fish and other aquatic life. The only answer to this is to install emergency equipment, so in periods of low flow such as were encountered in the fall of 1947 that such equipment could be put into operation to allow for the cooling of water and the reuse of the water in the plant without discharging any oxygen depleted water into the River. This matter has been taken up with the officials of the refinerys concerned and it is believed that the problem will be under control within a space of a few months.

In the Baton Rouge Area there have been no difficulties arising from refinery operations. The work done in the past two or three years at the refinery located in this area has resulted in a discharge of water which under normal conditions is absolutely harmless to fish life at the dilution at which it comes in contact with fish life and is devoid of amounts of oil which would constitute a nuisance. There is another project being planned for in this refinery that will result in a better method of separation of the oil from the waste water. The work is progressing slowly due to the fact that not much information is available about the character of the land which has been formed in the past few years in the locality where the separation pond is to be made and that studies of the soil must be made to see whether or not such soil will be capable of supporting the masonry structures necessary.

In the Norco Area progress is being made in the final plans to divert all hot water from the borrow pit on the north side of the highway running past Norco between Baton Rouge and New Orleans. Legal problems encountered in getting a right-of-way directly from the highway to the lake are such as to require a great deal of work before the plans which are now on the drawing board can be put into operation. When this plan is put into operation it will result in removing around ten thousand gallons per minute of water from the borrow pit and putting it directly back through a settling basin into Lake Ponchartrain. When this water reaches Lake Ponchartrain it will have no oil content and will be of such a character as to cause no harm to the aquatic life of Lake Ponchartrain, especially the crabs and the fish that are found on the shore in the area. When this plan is put into operation not more than fifteen hundred gallons a minute of water will be allowed to flow down the borrow pit and the plans are being made now to divert that portion of the waste straight into Lake Ponchartrain. Eventually this will mean that no more waste will flow down the borrow pit and there will be no steaming or other offensive results from the operation of this refinery. The officials of this refinery are very cooperative in this work and have kept this Division well informed as to their ideas and the progress that is being made.

Pine Products Plants and Creosoting Plants

In the early days of pollution abatement work there was constantly being encountered difficulties involving the discharge of wastes from plants extracting turpentine and allied products from pine stumpage. This waste contained terpines and other toxic materials and was very hard to treat and very very potent in contact with fish life, probably the most toxic waste that was being discharged into

Storage tanks for experimental fish.

the waters of the State. It is pleasant therefore to report that in the past few years there have been no complaints received by this office regarding discharge from naval stores plants. In that time there were two new plants constructed in the State of Louisiana, one at DeQuincy and one at Oakdale, and these plants were designed with the idea of avoiding any discharge of waste containing any turpentine, rosins or similar chemicals and a closed system has been developed. These plans were submitted to this Division and a tentative okey was made and it gives much satisfaction to see that these plants are operating so well. These plants are in the area which has many small fast streams containing a large amount of game fish and therefore it is doubly necessary that no discharge be made from these plants which would in any way cause fish mortality in these streams or cause them to deterorate to a point where they are no longer sources of sport fishing.

The creosoting plants which creosote timber products against termites and other insects are not so much a problem because as a normal thing no waste is discharged. Occasionally condensed steam which has some creosote in it is released. A certain amount of vigilance and care will result in what has been the case in the State in the past several years, no complaints about plants of this type.

IX. SAND AND GRAVEL PLANTS

When the Division first took on the job of pollution abatement in this State pollution from sand and gravel plants was a constant source of complaints in this State, especially in the Woolworth Area and in the Florida Parishes. Conversations with the owners of such sand and gravel plants and work by the members of the Division and the Enforcement Division have resulted in clearing up this condition. The streams that are affected are those that contain small mouth bass in appreciable quantities and while it is not alleged that such muddying up of the water by gravel plant washings will cause any fish mortality, it undoubtedly interferes with the fish by causing a lack of vegetation. Breaking the food cycle of the fish by interfering with the development of the minute forms of life on which the fish feed is also a result of this type of discharge. It also makes it impossible for sportsmen to catch these fish and therefore interferes with the camp owners and camp operators in the pursuit of business by causing the sportsmen to abandon the idea of fishing, making it impossible to rent boats and other equipment. Only twice in the past year have there been any complaints about a gravel plant and the second time the matter was forcibly brought to the attention of the operator and since that time there have been no complaints filed with this office.

Conclusions

As can be seen from the foregoing report the main problem that the Division has in pollution abatement is the cleaning up of pollution from plants already in existence when the problem of stream pollution was first considered seriously in this State. There are some conditions that it is going to be very difficult to change because of the location of the plant and the characteristics of the streams into which the plants discharge. There is, of course, a method of treating any waste but such treatment must be economically in line with the value of the plants from which the waste is discharged and the value of the products made by such plants. In other words, it would be impossible to call upon a man owning a $25,000 food processing plant to install a $40,000 or $50,000 sanitation plant to take care of his waste. Other and cheaper methods must be found for some of these plants before the pollution resulting from the discharge of the waste can be absolutely controlled.

There is one thing that should be emphasized in concluding this report and that is the change in attitude that industry has taken in the past several years in so far as the discharge of waste is concerned. In the days gone by the main consideration of any engineer in the location of a plant was raw material, labor and transportation. Now among the primary items to be investigated by any engineer locating a plant is waste control, if any such waste results from the manufacturing process. The constant supervision of the streams of the State by State agencies and the new awareness of industry of the importance of waste disposal will mean that in the future plants locating in the State of Louisiana will locate in such places and will construct in such a manner as not to constitute a pollution hazard from the day operation first began.